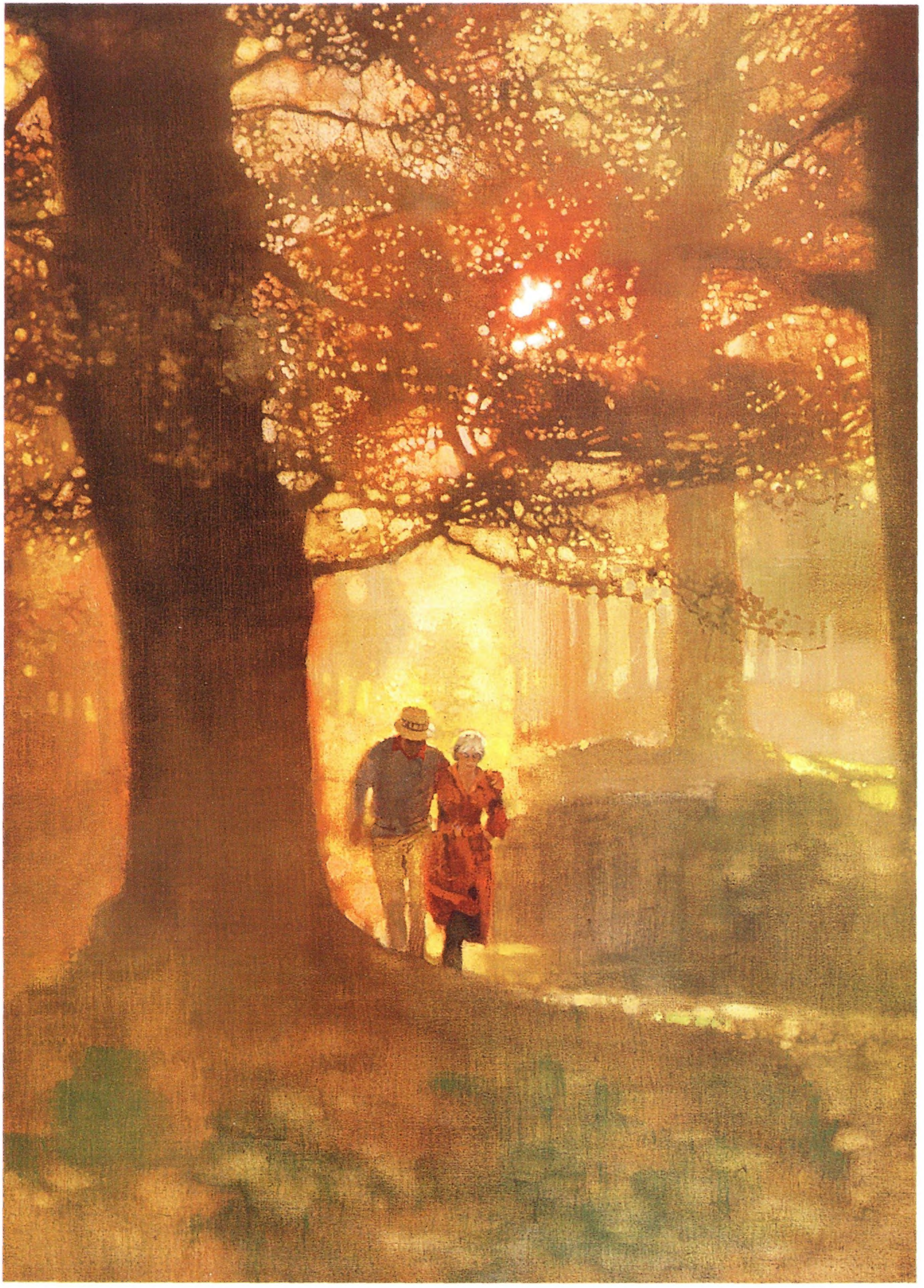
Smithsonian

June 1992

The First Good Sports

**Holding on to his hat,
an Egyptian hurdler
goes for the gold (p. 96)**



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Smithsonian

Volume 23, Number 3

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Smithsonian (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, DC 20560.
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Subscription price $20 a year in U.S. and possessions, $33 elsewhere. 80 percent of dues is designated for magazine subscription. Single copy price, $3. Second-class postage paid at Washington, DC and additional mailing offices.
Editorial offices at 900 Jefferson Drive, Washington, DC 20560.
Advertising and circulation offices at 420 Lexington Ave., New York, NY 10170.
Members: Please address all subscription correspondence and change of address information to Smithsonian, P.O. Box 55593, Boulder, CO 80322-5593.
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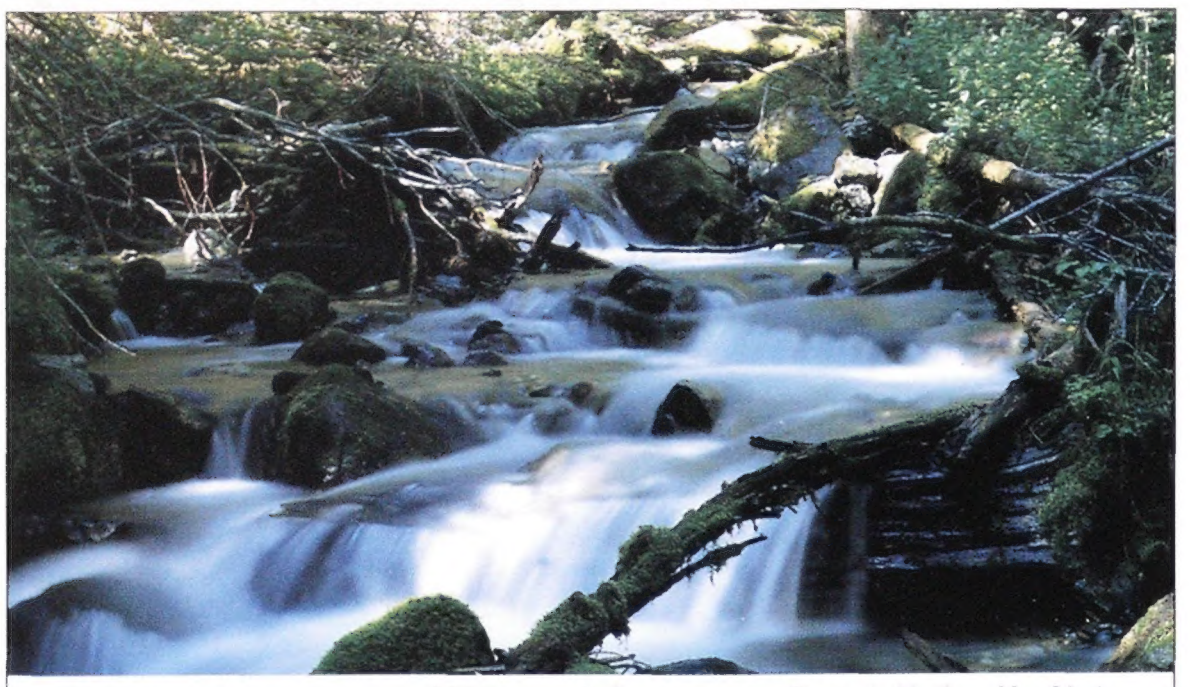

photo by Norman Johnson *Melting snow feeds a stream near Questa in Northern New Mexico.*

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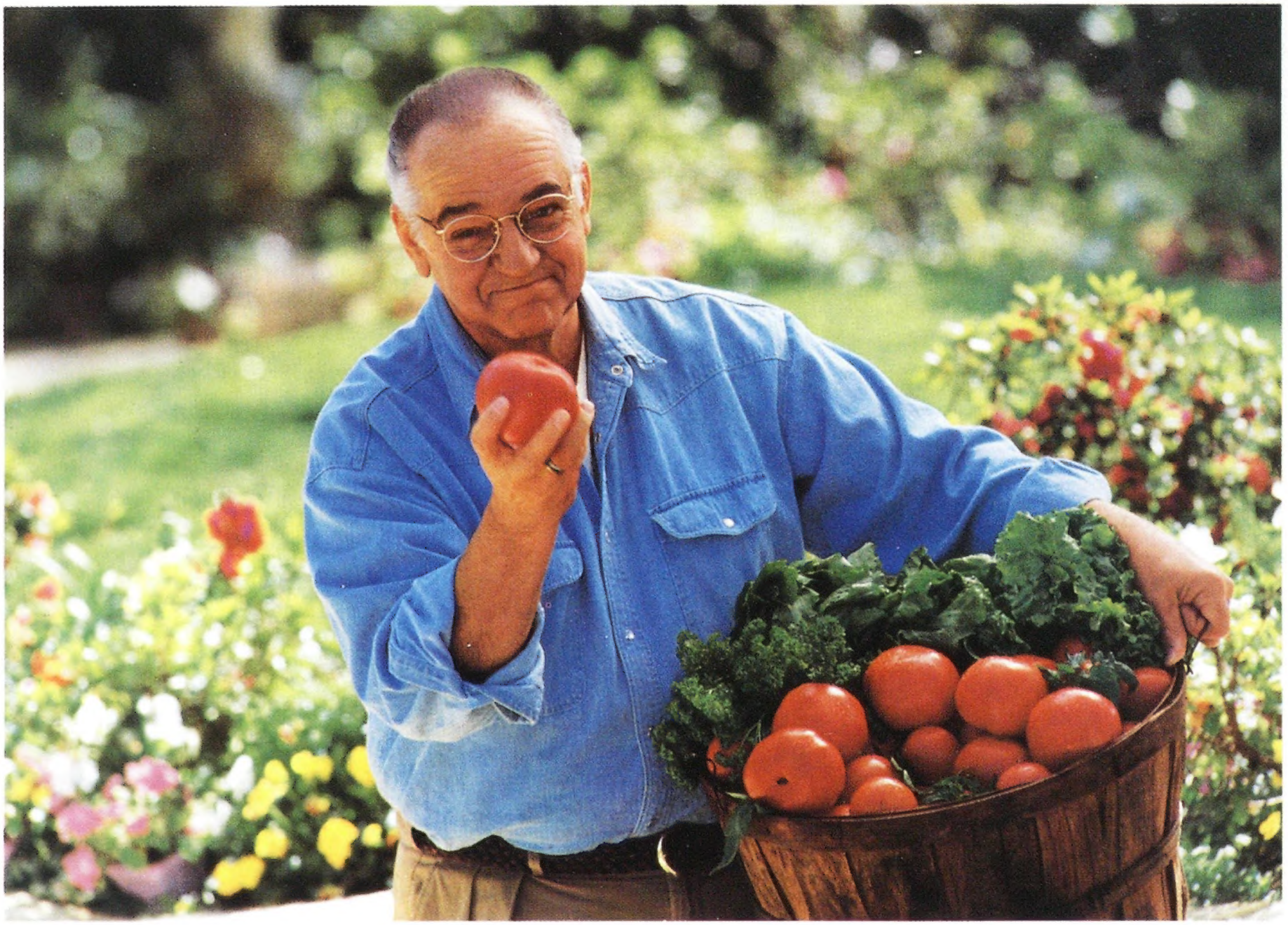

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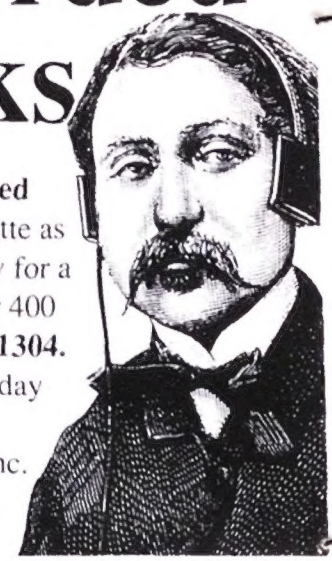

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Secretary Adams' comments

Smithsonian horizons

Some fundamental scientific advances could not have taken place without new technologies making them possible

Having once devoted a good deal of time to the ancient watercourse systems of southern Iraq, my attention has long been drawn to mapmaking. Spatial patterning of phenomena, particularly if their changes can be traced over time, has been a consistently productive avenue to quantitative as well as qualitative understanding. The less direct rewards are no less interesting—serious cartography can be a challenging technical exercise, the maps themselves often provide fascinating, unconscious clues to the cognitive world of those who made them, and at least occasionally they attain the status of high art or design.

Three current examples, at radically different scales and not all instantly recognizable as maps, illustrate the diverse ways in which new modes of apprehending spatial patterning are opening up entirely new scientific pathways. NASA's magnificent Magellan probe is one. Launched in 1989, this satellite was placed in orbit around our sister planet, Venus, in August 1990. Its radar sensors have picked up, for transmission back to Earth, an enormously detailed record of an essentially unknown topography.

More than 97 percent of the planet has now been covered in this way. For about 10 percent of it, separately positioned images permit stereoscopic renderings of its mountains and craters. Studies of the immense amount of new data no doubt will continue for years, but the certain result will be a comprehensive understanding of the otherwise forever-shrouded surface of the nearest equivalent we know to Earth itself.

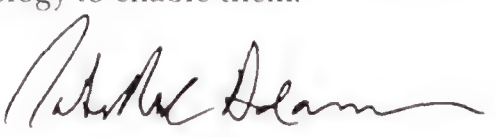
Apparently missing on Venus are all of the gigantic processes of plate tectonics that on Earth have continuously reshaped its surface. In the scorching atmosphere of Venus, liquid water cannot be present. This suggests that the existence of water, which enhances the ease with which rocks and minerals deform, is necessary for the dynamic movement of plates across the surface of Earth's mantle that is now understood to play so major a part in our own geological history. But the larger issue is simply that an entirely new field, comparative planetary geomorphology, has come into being. One can never again be entirely comfortable looking at our planet's landforms, and generalizing about the formative processes leading to them, without also taking into account what is known of our near planetary neighbors.

My second example is one that is being pioneered at the Smithsonian's Tropical Research Institute (STRI) in the Republic of Panama. The technology in this case is utterly familiar (if incongruous in this setting): a tower crane with a long boom or jib of the kind to be found on any high-rise construction site. In a tropical setting such as our Barro Colorado Island, this would permit scientists working in a gondola to be precisely positioned with their equipment in three dimensions, and to return to the same position day after day.

An installation like that now being tested at STRI just outside of Panama City overcomes obvious difficulties that have kept most rain-forest scientists at ground level, or limited to places in which they could be suspended by ropes from the larger branches of trees. Thus they were all but sealed off from some of the zones of maximum biodiversity and biodynamic interaction, the uppermost level of the forest canopy. With the tower crane we now have the means for accurate long-term, minimally intrusive monitoring—of sunlight impacts and other environmental changes, of the biogeography of all canopy biota, and of the physiological processes of plant life itself. There, too, we can now envision the possibility of an entirely new kind of dynamic topography, a contour mapping of tree-crown geometry and changing upper-canopy surfaces. Tree and forest life cycles, followed through time in this way, probably will come to be a new field of study.

Third, we proceed down to atomic scale, where imaging and manipulating individual atoms have long been major objectives. The exciting, relatively new technology in this case is the scanning tunneling microscope (STM). In its fundamentals, a probe tip is moved just above the surface of conducting materials, its height continuously adjusted to maintain a constant current between the two. Recording the trajectory of the probe tip creates a map of the nanotopography of the surface, with each atom appearing as a separate cone or bulge. From this there is already emerging a new approach to the science of surfaces.

There is also a lesson in these examples on the contribution of new technologies and instruments. We often characterize these as merely "applied science," distinguishing them from fundamental scientific advance as the source of most of the creative ideas. But the real relationship is more complex, less unidirectional. Not infrequently, whole fields of science could not even be foreseen without the advent of some new technology to enable them.



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Letters to the Editor

Bandit

Dear Sir: Referring to your April issue, no one truly involved with the raising of dogs supports ownership of any dangerous animal. However, in the case of a "dangerous dog," it often becomes apparent that the problems lie in nonprofessional breeders with no regard for genetics, or in the placing of the wrong type of dog with the wrong type of person, or the neglect and mistreatment of a dog by its owner.

If the animal-rights extremists win, we will have no guide dogs, bomb detection dogs, therapy dogs, search-and-rescue dogs, hearing-ear dogs, dogs for the handicapped; and many of us will lose our dearest and most devoted friends.
Kerry Much
Vancouver, Washington

Dear Sir: As the grandparent of a child mauled by a pit bull, I find your cover and article disgusting. Children are more important than dogs!
Dorothy Kilker
Scottsdale, Arizona

Dear Sir: My grandfather gave me a beautiful 2-month-old pit bull when I was 2 years old. For 15 years she was a gentle, loving companion. She did attack two people: one who was trying to climb through a window into our home; the other, a man who forcibly grabbed me when I was 4. Without her, who knows what would have become of me.
Eleanor B. Sellers
Portage, Indiana

Dear Sir: As Director of the Center for Applied Ethology and Human-Animal Interaction of Purdue University's School of Veterinary Medicine, I take issue with Ms. Hearne's comment that dogs bite because of the victim's testosterone level. Human males are more frequently bitten by straying pets because male children play more on public property than do female, and dogs bite more male adults because males, more than females, have occupations requiring trespass on other people's property—e.g., letter carriers and meter readers experience very high bite rates.
Alan M. Beck, ScD
West Lafayette, Indiana

Electric cars

Dear Sir: I'm all for electric cars or something far less polluting than what we now have. Electric cars, however, will never take off until we've overcome our ever increasing need for power. Coal is not unlimited; it is dangerous to obtain and despoils when strip-mined. Natural gas is not unlimited and has its hazards. We soon will be losing many of the early nuclear power plants, and I see no possibility of building new ones. Our rivers are incapable of providing any worthwhile additional percentage of power. Wind and solar power have not yet shown sufficient promise to be feasible. Where do we turn?

It disturbs me to see the quantity of new electrical conveniences continually coming on the market without our giving thought to this question. If we can produce a practical electric car there will be a tremendous increase in demand for power. I surely hope that someone is doing some serious work to come up with an answer.
M. B. Monahan
Hyde Park, Vermont

Dear Sir: I have been driving my home-converted electric 1959 MGA Roadster since 1974 as a second car. A person with some mechanical skill can convert a gas car to electric operation at considerable cost savings.
Bob Wing
Electric Auto Association
Belmont, California

Dear Sir: Your article stated that "Honda has retained the services of Alan Cocconi . . ." Although Honda has the utmost respect for Mr. Cocconi, we have not entered into, nor signed, any agreement with him.
Gunnar Lindstrom
Honda R&D North America, Inc.
Torrance, California

Salem witch-hunts

Dear Sir: Bruce Watson failed to make a clear distinction between Wicca and Satanism. Wicca is not a revival of superstition or Satanism but a commitment to humanity's respectful and cooperative relationships.

It is nonhierarchical, conscious of life's interconnections, and encourages personal responsibility for cooperative lifestyles. All that is eternal and generative we call Goddess; all that dies and is reborn we call God. Ignorance, fear and greed—what monotheists call "evil"—are, in our terms, choices for which individuals are responsible. What we put into the world returns to us threefold, so by their natural consequences as well as by our understanding of moral law, we are discouraged from making ignorant, fearful or greedy choices.
Ashleen O'Gaea
Tucson

Dear Sir: The minister to whom Sarah Good said, "I am no more a witch than you are a wizard! If you take my life away, God will give you blood to drink!" was Nicholas Noyes, a remote ancestral uncle of my wife's. Noyes later repented of his actions and attempted to make amends to the victims' families.
Norman Rudnick
Oakland, California

A.S.W. Rosenbach

Dear Sir: Dr. Rosenbach's purchase of *Alice* was a providential act. It was safe in America during the destructive days of World War II. Eldridge R. Johnson led the Americans in the repurchase of the manuscript in honor of England's valiant ordeal. Dr. Luther Evans, then Librarian of Congress, personally presented it to the British Museum.
Tom Doyle sr.
Bristol, Connecticut

Biological arms race

Dear Sir: Having spent some years in tropical America as a guide, photographer, student and observer of the denizens of the bosque and the thicket, I had a close acquaintanceship with their big cat, the jaguar. He is a silent assassin, and responds to a sticky situation with a hiss or a whistle instead of a roar.

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fatales know he is in the area, the male roars enough to vibrate the leaves off the trees in the canopy above, followed by rumblings and subdued snarls.
Juan Guido
Carson City, Nevada

Dear Sir: Michael Robinson's statement "Seventy-five thousand deaths in one day is a scale of slaughter unknown before 1945" is historically incorrect.

Prior to the arrival of Cortés, the dedication of the main Aztec temple was marked by the sacrifice of 80,000 human victims. The Mongols' sack of Baghdad in 1258 took hundreds of thousands of lives on its initial day.
George Pogue
Phoenix

Seattle Art Museum

Dear Sir: Among SAM's great treasures is a world-class collection of Korean art. It includes the fifth-century jar [below] given by SAM trustee Frank S. Bayley III, which Sherman Lee—for many years director of the Cleveland Museum of Art and a renowned expert in the field—recently called the greatest Three Kingdoms pot of its kind in the world.
Bruce H. Hasenkamp
Hillsborough, California

T-shirts

Dear Sir: Harley-Davidson motorcycle riders are all avid collectors of Harley T-shirts. For every race, rally, ride or charity event, a special design is worn proudly by riders to show their competitive spirit and the places they have been. T-shirt sales at rallies bring in many dollars for bikers' favorite charities. Those with "Milwaukee" and "Harley-Davidson" are the most prized. We have sent Harley shirts with its Milwaukee address to our grandsons, and they tell us people have offered to buy them right off their backs.
Daniel and Margaret Rasmussen
Milwaukee

Dear Sir: The 1978 American Women's Himalayan Expedition's climb of Annapurna was financed largely by the sale of shirts bearing the slogan "A Woman's Place is on Top . . . Annapurna."

I still treasure the two I got at the time and wear them only on special occasions, such as hiking the Muir Trail or attending mountaineering meetings.
Martha L. Voght
Bishop, California

Around the Mall and beyond

Dear Sir: When I was a boy in Los Angeles we lived close to where the movie companies kept single-sided streetcars for shooting interior scenes. A large house at Second and 52d had a big yard and patio where the actors, extras and crew ate catered lunches.

We often saw and met the very funny Charley Chase, and Laurel and Hardy. Stan Laurel was the brains behind many of the sketches.
Sam A. Hattem
Central Point, Oregon

Dear Sir: How is it possible to refer nostalgically to the *Saturday Evening Post* without mentioning Glencannon, engineer on Guy Kilpatrick's *Inchcliff Castle*, Captain Ball commanding? It was Glencannon who, after persuading a dockwalloper to carry his sea chest on board, tipped him a nickel and said, "Dinna embarrass me with your protestations of gratitude."
Frank Holan
Westminster, Vermont

Dear Sir: I have used John Taintor Foote's *Dumb-Bell and Others* in my classroom since 1960 to entertain and to encourage student interest in reading and writing. I have read parts of *Trub's Diary* to civic and church groups, always to a great cry for more!

Today former students, with their own youngsters in tow, ask me how they can get a copy of *Trub's Diary* to read to their children.
Ken Olson
Bakersfield, California

Dear Sir: Reading the *Saturday Evening Post* as a boy, I assumed that Arthur Train invented Tutt. Then, some 50 years ago, and well into *Yankee Lawyer, The Autobiography of Ephraim Tutt*, I realized Tutt existed and had in fact written the book himself. After he moved from a small upstate town to New York City, Tutt became a close friend of lawyer Arthur Train, who asked permission to write stories about him and his country law practice, as related by Tutt.
G. B. Lemmon jr.
Springfield, Missouri
Sorry, Mr. Lemmon. Arthur Train's 83 Tutt stories in the Saturday Evening Post, *during 25 years, were so popular he wrote* Yankee Lawyer, *never expecting it to be taken as fact. When letters and phone calls poured in, and* Who's Who *wanted to list Tutt, Train decided he'd best 'fess up that Tutt was pure fiction. One irate* Post *reader shot back: "The fact is, Mr. Tutt invented Train."* Ed.

Smithsonian horizons

Dear Sir: In response to Secretary Adams' statement "There is . . . no easy litmus test for distinguishing positions that are grounded in sound scholarship from those that are more strictly ideological," there *is* a simple and reliable test. Scholarship admits the possibility of error. For an illustration of the consequences of unrestrained ideology, see "Thou shalt not suffer a witch to live" on page 119.
Paul F. Doering
Rochester, New York

Dear Sir: Secretary Adams' column ascribes prescience to "Washington lawyer Duncan Cameron," writing 20 years ago. Duncan Cameron, a Canadian museologist who wrote "The Museum: A Temple or the Forum?" (*Curator*, Vol. 14, No. 1, 1971), has not, to his knowledge, been admitted to the bar in the District of Columbia. He is the Director Emeritus of Calgary's Glenbow Museum.

I am pleased that Secretary Adams recalled my paper, and the attribution of prescience is not to be sneezed at, but the imputation "Washington lawyer" might be grounds for a defamation suit. Would you be kind enough to disbar me in the next issue? It would be prescient to do so before I call my Philadelphia lawyer.
Duncan F. Cameron, FMA
Calgary, Alberta

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Around the Mall and beyond

On an otherwise ordinary day in 1963, an island was born in the Atlantic. Surtsey, as it was named, suddenly appeared, a 330-foot-high, two-thirds-mile-long mass of lava, smoking and fuming in what had been just plain old ocean a little south of Iceland. And as soon as its nativity was discovered and word spread, a host of scientists, including one from the Smithsonian, swarmed about it to see what was up, down there on the Mid-Atlantic Ridge.

Surtsey's birth was a big-time earth-science event. Happening as it did in the dawning Information Age, news of it got around pretty quickly by radio and television. But Sidney Galler, then the Smithsonian's Assistant Secretary for Science, felt that scientists should learn of such sudden, natural phenomena even more quickly.

Galler, bald and big-shouldered, kicked around the idea of a hot line to alert scientists almost instantly to earthquakes, eruptions, floods and other earth-shaking events. He pictured a network corresponding, in a small way, to our country's early warning system, the DEW line, which, back then, kept tabs on Soviet flights and missiles.

The Smithsonian Astrophysical Observatory (SAO) already housed the International Astronomical Union's Central Telegram Bureau. It's now about 70 years old, and it's the place star-watchers call when they think they've spotted an asteroid or a new comet (see page 74). And in 1957, it organized a Satellite Tracking Network to keep an eye on things like *Sputnik I*, the Soviets' new, man-made moon, and the other Soviet and U.S. satellites that

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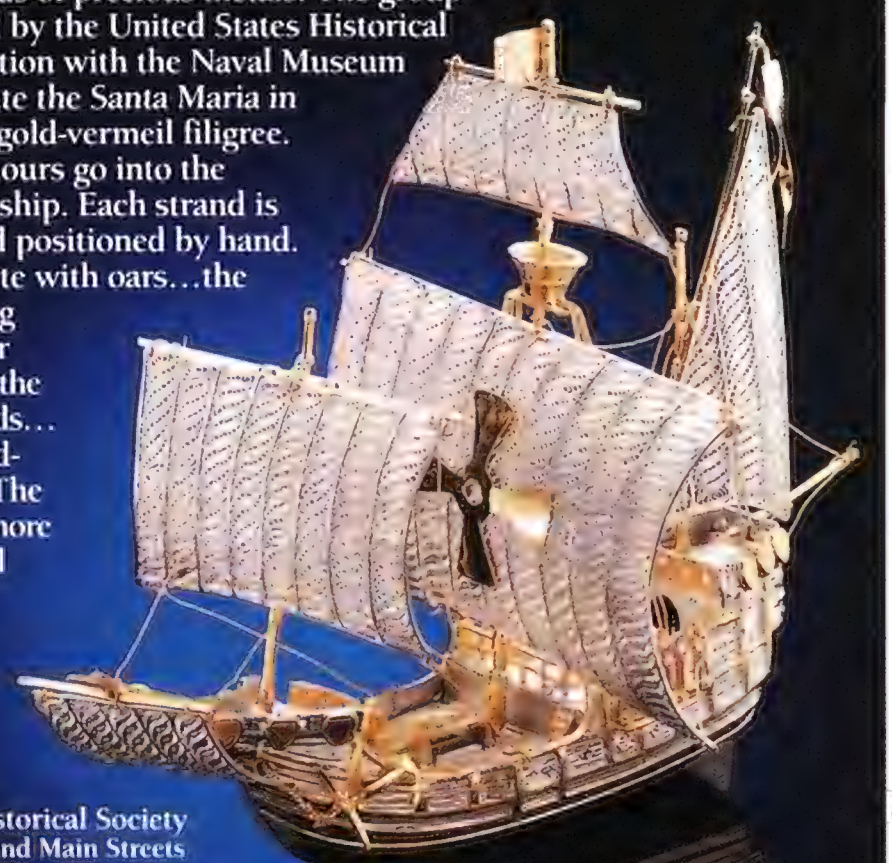

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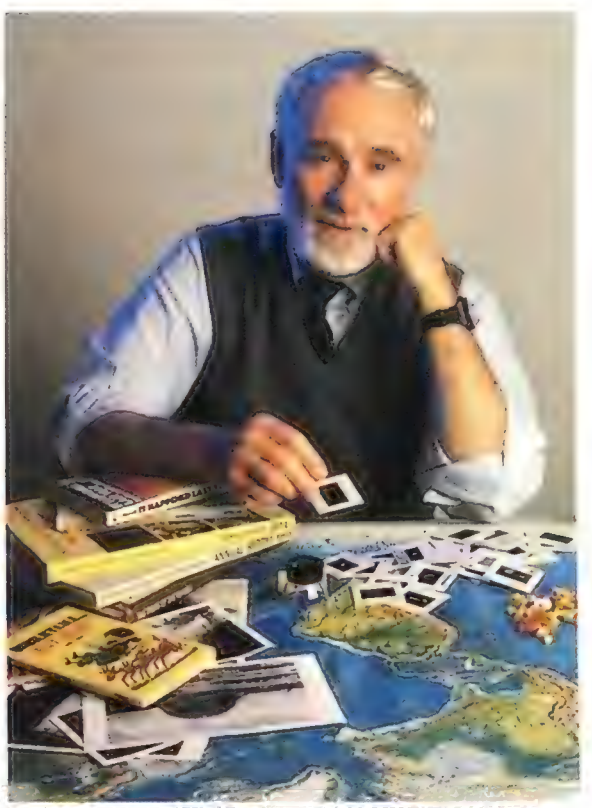
followed. So Galler's hot line idea was perfectly feasible.

Plans were made for a network that would quickly collect and disseminate news of various rapidly occurring earthly events. It was called the Center for Short-Lived Phenomena, a fine bureaucratic name, although few people could agree on how to pronounce "lived." Long or short *i*?

No sooner had it opened in January 1968 than it received news that another volcanic island had recently erupted from the Pacific, near Tonga. The new Center spread the word far and wide, and managed to divert the Smithsonian's Charles Lundquist, en route to Australia. He took a detour, paid a visit to the newly born—and quickly dying—Metis Shoals, and brought back some fragile, frothy rock that had spewed out. Since Metis Shoals lasted only 57 days before being pounded to pieces by the crash of Pacific waves, that rock was important to science. However you pronounced it, the Center for Short-Lived Phenomena was off and running.

"Robert Citron, a former satellite tracker at the Smithsonian, became the director and soon started issuing announcement cards of various happenings," Jim Cornell tells me. Cornell's an old friend—publications manager for the SAO at Cambridge, Massachusetts—and I'd got him reminiscing about old days.

"The cards went to all our star-



As PR man at Smithsonian Astrophysical Observatory, Jim Cornell handled the publicity for Earth's arcane occurrences.

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watcher friends. But anyone could get on the mailing list, amateurs as well as scientists. And of course news correspondents. It took only a couple of years for the mailing to grow from 300 to about 3,000, in 148 countries."

In its first three years CSLP, as it was soon labeled (one way to get around that *i* problem), noted a total of 52 volcanic eruptions, plus 66 major earthquakes. There were also 34 fireballs reported and 13 meteorite falls. Landslides, tidal waves, storm surges and floods all made the list.

"Here at last was a place to report oil spills," Cornell says, going over the figures. "We had 51 of them, all around the world, from 1968 through 1971."

Reports about the odd doings of creatures large and small also flooded in and were written up under a Smithsonian logo. I have an early example: "Smithsonian Center Reports: LEAF-CUTTING ANTS DESTROY PERUVIAN TROPICAL FARMLAND." It tells about millions of the big-headed, brown ants (*Atta acromyrex*) chomping their way through citrus groves and "causing the lush green fields to vanish." It adds the interesting note that the creatures avoid banana trees, so, to protect the other trees, farmers began ringing them with banana leaves.

The CSLP handled news of an infestation of one of Spain's Balearic Islands by ravenous dormice, which devastated crops in 1971. During the same year, army worms (actually moth larvae) invaded East Africa. A year later, Queensland, Australia, suffered a similar plague of house mice. And Scottish birdwatchers found puffins getting rare on the island of Dun.

Such booms and busts in populations can generally be explained by changes in the environment, and usually the sudden plagues simply level off, then diminish. In the case of the dormice, one cynical explanation was offered: the island farmers fabricated the crop loss in order to wangle government aid.

Thousands of fish suddenly died in a New Jersey coastal creek. Why? A nuclear power plant had warmed the water, inveigling fish to winter over in the stream. Then the plant was closed, and the water temperature dropped.

"The center wasn't very critical in those days," says Cornell. "The word of a phenomenon came in, was read, then sent out into the network without too much editing, except for adding a snappy headline."

"Malaysian Frog Wars," for example, headed a CSLP story reporting millions of frogs in a pitched battle near Kuala Lumpur. They seemed intent on drowning one another. Great story. Everyone read it. Then—oops!—it turned out that the frogs were making love, not war. And so the mistake itself became another highly popular item for CSLP. "The first story had probably originated with some bored feature writer on the *Malay Mail*," says Jim, "and was picked up by a news service."

The mysterious brightening of the night sky at Naini Tal, India, was another input for the Center. The world of science read the announcement that in this hilly area, northeast of Delhi, a strange luminosity would suddenly appear, waver and then vanish. What could it be?

A beat-up Indian jitney, is what. As the

vehicle climbed those hills, its loose headlight wavered upward and cast a beam onto the low clouds. End of mystery.

Such stories brought the Smithsonian a lot of publicity and also opened the floodgates to a spate of letters with oddball natural or cosmic happenings to report. "Three years ago," Jim recalls, "at the annual meeting of the American Association for the Advancement of Science, there was a contest for the strangest letters received by science writers and PR people. We pinned them up on a bulletin board, then pasted stars on the weirdest ones. I put up some of the Center's letters and placed first, second and third."

The Center's files furnished Jim with material for a number of books, mostly for young people. I found one in my local library, *Unbelievable . . . But True!* Sure enough, here were the mouse-migration stories, and also such choice tidbits as a battle between two killer whales and an elephant seal (the whales won), the sudden extrusion of huge rocks that burst from an Oklahoma pasture (shoved upward by pressure from propane gas), and the backyard of an Icelandic home that exploded in flames and spurts of lava—the eruption of Helgafell in 1973.

I also enjoyed reading about a rain of fish in the Australian tropics. Australia harbors a wealth of wacky natural history, and Australians—otherwise delightful—have a national tendency to supplement the facts with a few whoppers here and there. "A rain of fish" sounds like a whopper, all right, but that one happens to be quite possible. Waterspouts—common in the tropics—hoist up the fish; surrounding showers dump them. I've often tasted salty rain from seawater similarly sucked up.

Anyway, Bill Tapp, a station manager (ranch foreman) in the hot far north, reported the fish fall, and, writes Cornell, "When the Center for Short-Lived Phenomena asked him for more information about this unusual downpour of fish, he replied simply: 'They look like perch.' "

Highly successful as it was, the uncritical CSLP was bound to raise eyebrows among scientists. "Many felt that the Center's announcements were turning into a scientific *National Enquirer*," Jim says. "Eventually the program was closed down."

What remains of the CSLP in the Smithsonian is the Global Volcanism Network at the Museum of Natural History, which concentrates on news about volcanic activity.

As for the word "phenomena," it is very much in use at the Smithsonian, and you can see it just a few pages farther on, in Jack Wiley's column, *Phenomena, comment and notes.*

When Jake Page, a former editor here, originated the column 20 years ago, he used the CSLP reports as a launching pad for his comments. In recent years, with the CSLP no longer extant, Jack's column has evolved into a personal look, sometimes whimsical, often serious, at science and nature. And so, what started out as a report on an undersea volcano lives on in Jack's enlightened musings about, say, the environmental correctness of boiling water for tea. As evolution goes, that's not bad.

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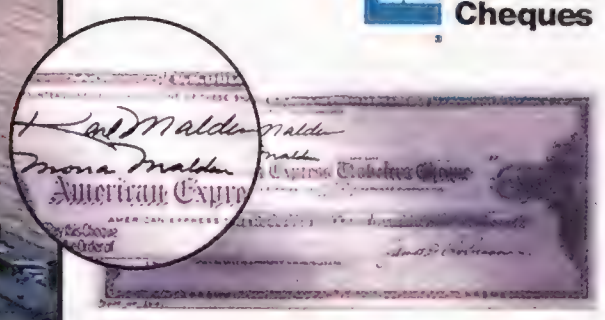
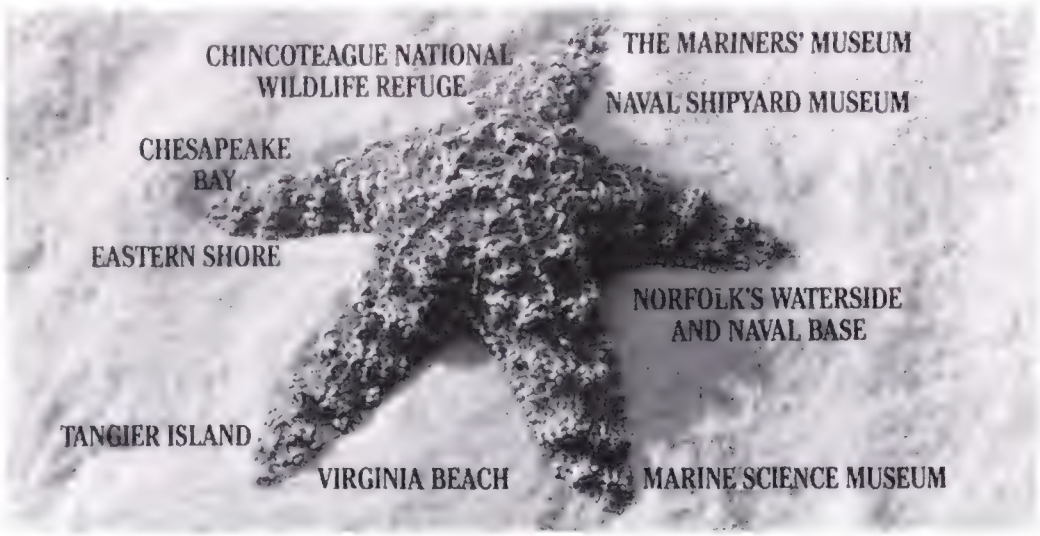


companions who aren't companions constantly.



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Phenomena, comment and notes

The landscape outside a nature reserve determines its ultimate fate; that is where the rest of us can do something

Years ago an old friend of mine went to the Jodrell Bank Experimental Station in England to do a story. The then director, Sir Martin Ryle, escorted my friend around what was at that time the largest steerable radio telescope in the world. At various places Ryle would stop and tell my friend that they were at one of the spots from which all photographers shot their pictures. My friend dutifully clicked away.

More and more as the years go by, weekend naturalists are reduced to just such regimentation. To see what we want to see we travel to the designated spot. We look, perhaps make a note or take a picture, and then walk back to our car. This makes sense in extraordinary cases, for example when a birding hot line has announced that an extremely rare bird, perhaps from another continent, can be seen somewhere in the country. The hot line provides detailed directions, not only about what airport to fly to and what freeway to take, but in which bush in what field at what farm on which country road to look. (Chaotically parked cars and crowds of people with spotting scopes usually mark the spot.)

Nowadays that's how it works, even for casual Saturday-morning birding in local parks. You start out knowing exactly where to go to see what, moving from one place to the next like a tourist "doing" cathedrals. Pick up one of the proliferating books that tell you where to look for birds: James A. Lane's *A Birder's Guide to Florida*, for example,

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or Claudia Wilds' *Finding Birds in the National Capital Area* that I use so often here. They will tell you in excruciating detail exactly where you can find the bird you want.

The remaining places where wild things can still be found in any numbers are small, widely separated green marks on the map, proportionately not much larger than the worn spots whence visiting journalists shoot the Jodrell Bank telescope. When you bring a friend on a "back-to-nature" expedition, it can be embarrassing. It is *nothing* like a 30-day trek from Great Bear Lake to Great Slave Lake in Canada's Northwest Territories. Instead you drive to a sanctuary parking lot, follow an asphalt trail, cross a wooden footbridge, walk out on a boardwalk. Later you rest on a bench and use restrooms complete with running water and electric lights.

Even without the accouterments of civilization, these forays are less than a wilderness experience. We are dealing with the scattered remnants of the natural ecosystems that used to exist. These fragments, these parks and refuges and biological field stations, are by no means perfect or even necessarily good samples of the original habitat. They were not chosen to be representative. They are simply what was left when all the rest had been taken for towns and cities, agriculture, highways, clear-cutting and strip-mining. In many cases the fragments themselves were once farmed,

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logged or mined. They are in a very real sense islands, isolated from one another in a sea of human activity, subject to the same biological limitations as are true islands in the world ocean. These are the places most of us head for when we want to spend a day in the wild. Few and far between, they are also impoverished.

Biologically speaking, there is less to these fragments than meets the eye. They are not covered with glass or enclosed in Lucite but, rather, are susceptible to every insult that originates beyond their borders. The smaller the fragment, the truer this is. Last year three researchers in Australia, Denis A. Saunders, Richard J. Hobbs and Chris R. Margules, using examples from around the world, spelled out the problems in a review article in *Conservation Biology*. For example, with the vegetation outside a reserve reduced or gone altogether, summers are hotter and winters are colder; frost is more frequent. This change alone can alter the vegetational makeup of the fragment, at least along the edge. Then there are physical forces: increased evapotranspiration and desiccation, for example, from winds that penetrate deeper into the interior. Along a park boundary the wind now strikes with full power; what were once interior trees are ill-equipped to survive such assaults. Eventually they are blown down, so that trees farther in are now on the edge, and the cycle repeats. The hydrological cycle is altered, often for the worse; more water runs off and less soaks into the ground. Remnants in valley bottoms catch soils eroded from the slopes; such disturbed ground is ideal for invader species.

Predators and parasites penetrate deeper into the interior. So do exotic plants that can completely change the character of the fragment. They may have different burning characteristics, for example, and thus change the frequency and severity of fires. Or they may simply inhibit the regeneration of native plants.

The isolation itself will have an enormous impact on the fragment. Organisms that depend on native vegetation, those that require large territories, and those that were present in low densities to begin with will be the first to go. On the other hand, it may take several hundred years for long-lived species such as trees to disappear. Whether the remnant can continue to be colonized by native species from the outside depends on the distance to other remnants. Invasive and edge species will move in, so the number of species present may actually increase. The mix will end up being very different.

In most areas, new wildlife sanctuaries are going to be hard to come by. For the foreseeable future, we are stuck with the fragments we have. Managers will do their best. But if we want those fragments to be as representative as possible, to preserve whatever biodiversity we have left, then we have to work on the external threats. As the Australian biologists write:

"Since most impacts on remnant areas originate from the surrounding landscape, there is clearly a need to depart from the traditional notions of re-

serve management, and look instead toward integrated landscape management. It will become increasingly difficult to maintain remnants of native vegetation if the management practices in the surrounding matrix have continuous adverse impacts on them. Traditional reserve management stops at the reserve boundary; fluxes of water, particulates, and organisms do not. Placing the conservation reserves firmly within the context of the surrounding landscape and attempting to develop complementary management strategies seems to be the only way to ensure the long-term viability of remnant areas. . . . This has important implications for land managers since it involves a radically new way of viewing management and requires that neighboring land uses, and hence neighboring landowners, interact in a positive way. This is difficult, but not impossible. . . ."

That "landscape" the Australians keep coming back to is the rest of the world; it is us and the places where we live and work. Refuge managers control their remnants, but it is the rest of us, the body politic, society as a whole, who "manage" the remainder. If we think of "nature" as only the protected remnants, places to be visited on weekends, then we will not care so much about the rest of the landscape. Yet it is the quality of the rest of the landscape that will determine whether the wild creatures we are trying so hard to protect will survive for centuries or only for decades.

In the best of circumstances, the diversity of large mammals in even the largest parks and refuges will dwindle. In smaller parks, interior species will vanish once the openness and predation we associate with edges meet in the middle. No matter what managers do, survival of species will depend on what is going on outside the park.

Some fragments are lucky enough to have buffer zones: a national park embedded in a national forest, for example. Others are having good things happen to them, such as the 107,600 acres added to Everglades National Park by the federal and Florida governments in 1989 or the Nature Conservancy's recent assistance in protecting the 417-acre Burlington Bottoms wetland just outside Portland, Oregon.

At first glance the Everglades addition would seem to have had little to do with ordinary citizens. Even after Florida donated 35,000 acres, the cost came to at least $40 million. It seems fair to assume, however, that the individual human beings within the federal and Florida governments who made the decision knew that there are large numbers of individual humans—voters—who want the Everglades to survive.

People join organizations like the Nature Conservancy, of course, specifically to save more of the landscape. Land trusts, birding organizations (which often have a compulsion to create sanctuaries), preservation groups that include scenic easements in their goals—all have a significant part to play in keeping nature in the landscape.

Then there are citizens' groups, permanent and ad hoc, working to influence the Bureau of Land Management,

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the U.S. Forest Service and other government agencies that control immense stretches of landscape.

In the private sector, cattlemen, timber and paper companies, and corporate farmers probably control the biggest pieces. Citizens can try to influence government agencies. Private landowners, even those working under extreme financial pressures, may sometimes find it possible to set aside fragments of their own. When these fragments are in the corners of properties and abut other such protected fragments, as is beginning to happen on South American ranches, the whole is greater than the sum of its parts.

As for the rest of us, all is not hopeless. The exurban homeowner, whose house sits on several acres, clearly has the option of re-creating in a small way the habitat that once naturally existed on his or her land. (Landscaping with native plants, whether in the lush Northeast or the xeric Southwest, is becoming increasingly popular as people's biological literacy level rises.) On a smaller scale the same is true for the suburban homeowner, who can get ample good advice from the National Wildlife Federation and from the National Institute for Urban Wildlife on turning the smallest backyard into a wildlife refuge. (When a group of neighbors does this, the results multiply rather than add. The backyards merge into a single "island" ecosystem, many times the size of any single lot. Birds will find it, of course, and depending on how far it is from other fragments, a surprisingly long list of invertebrates, amphibians and reptiles, and even small mammals also will find their way there.)

Suppose the worst: things have been a little tight lately, and you have sold your 100,000 acres of timber, the 10,000-acre ranch and the 1,000-acre farm. You no longer have the country place on 5 acres, or even the suburban castle on 0.5 acre. You have no landscape of your own on which to have an impact. No matter. You can always join with like-minded citizens to protect still-wild landscape. Work with the Nature Conservancy or civic groups on the local, county and state level to find creative (read "cheap") ways to protect more fragments. Push "greenways," the strips along rivers or old railroad rights-of-way, that will become a network of footpaths connecting the entire country (and in some cases, providing corridors for wildlife to move from one remnant to the next).

Join the local garden club. Not only do such groups function as mutual-aid societies, but many around the country take it upon themselves to beautify their locality by planting everywhere they can, from around the abandoned railroad station in town to along the median strip of the highway out of town.

Find out how you can not only protect what still survives but also restore to life that which has been destroyed. With so little pristine land left to preserve, restoration ecology is a major hope for the future. As I write this column in April, for example, the *New York Times* is reporting on studies by the Desert Botanical Garden in Phoenix on how to restore millions of acres of

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abandoned cottonfields in southwestern Arizona to typical Sonoran Desert—its salt-bush scrubland and cactus, its night-blooming cereus pollinated by bats, and its hawks, coyotes and burrowing owls.

At the personal level, no effort is too small. How about putting a five-foot shrub in a plastic tub of dirt out on the balcony? Or a row of houseplants in pots on the sill of a window that you open in good weather? A couple of plants for the office? They all clean the air that will move into the nearest remnant. In my fantasy world, every balcony on my apartment building is crowded with flowers and shrubs. The building becomes a cross between the Hanging Gardens of Babylon and a 14-story tree, purifying the breezes flowing into nearby parks.

Planting things in our backyards or on our windowsills could help to slow global warming. Improve our collective health and keep us alive. I seem to recall that F. Herbert Bormann of the Yale School of Forestry once estimated it takes 4.5 acres of land for the average American to maintain his or her standard of living. His number includes half an acre for buildings, roads and so on, per person; two acres for croplands and pasture; and two acres of "wild" land to clean the air, maintain the hydrological cycle and the rest of the life-support functions to which we all owe our continued existence. The surviving remnants of the ecosystems that once were, also need those wild patches in the rest of the landscape if they are to survive. And that's where we come in.

John P. Wiley jr.

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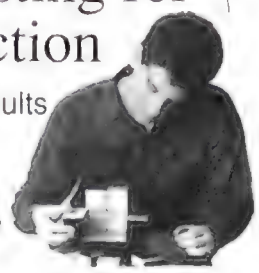

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Enmeshed humpback keeps wary eye on disentangling hook at end of a sawed-off hockey stick wielded by Lien.

By Fred Strebeigh

Hooked on whales

Since 1978, Jon Lien and his assistants have freed more than 600 humpback whales caught in fishing nets off the Newfoundland coast

Photographs by Bryan and Cherry Alexander

By midsummer along the Newfoundland shore, at the easternmost reach of North America, it's whale season. Wherever you fish, in Bay Bulls or Chance Cove or Joe Batt's Arm, you catch whales. Whatever you're after, cod or salmon or capelin, you catch whales. That's life: You want fish? You get whale.

The Folletts got their whale a year ago. It snagged in the big net that Fred and Ambrosene Follett anchor by the shore to catch codfish, not far from their house in the fishing town of Grand Bank. Both felt pity. Fred thought, "He's a harmless creature, ain't he?" They knew that the whale, left alone, would probably die, thrash their net to shreds, or both. So they did what you do when you catch a whale: you call the Memorial University of Newfoundland and ask for Prof. Jon Lien.

knife and a sawed-off hockey stick with a hook where its blade used to be. Directly in front of me, cantilevering outward over the gunwales, wearing diving goggles and snorkel, is Jon Lien. I am holding his ankles.

Jon is face-to-face, underwater, with the whale. It looks tense, wild-eyed. Jon looks for an easy solution: the right place to cut net, if necessary, or the right route to urge the whale toward freedom. With a calmer humpback, Jon might touch it, shove at it, use the boat's rubber gunwale to poke it along—the way a cattleman might prod a cow through a gate. But this whale, eyeing Jon's begoggled face, seems to send a message: "Do not touch." Seeing these wild eyes, Jon keeps our distance—about 12 inches.

Jon emerges from the water smiling (in his goggles

Two orange-clad assistants, Wayne Barney and Amy Verhulst, watch anxiously (above) as Lien tries to release young humpback from cod-trap nets near Fermeuse. Fishermen in dory stand by to help out if needed.

Five hours later, Jon Lien and his assistant Wayne Barney and I are bobbing in a rubber inflatable, two feet above the head of a midsize humpback. In length, it overwhelms us: lay the three of us head to foot, then add our boat, and the whale's 35 feet outstretches us all. In weight, three men and a boat, we could counterbalance perhaps one-fortieth of this whale; we hover over it like flies.

From above, the humpback's white flanks, seen through the clear Newfoundland water, look like the walls of an aquamarine swimming pool. Its black back looks like oil-slicked tarmac. Its humped black dorsal fin, the fin that gives the humpback its name, has been scraped in the Folletts' net to the color of cut salmon.

To my right, Wayne Barney, a full-time fisherman until he reached age 20 and now a student at Memorial, is holding the whale team's basic tools: a razor-edged

looking a bit like a nearsighted walrus) and gives his diagnosis: netting has caught on whale chin, whale beard and whale barnacles—chronic hitchhikers on humpbacks and a major reason why humpbacks snag on nets. He asks Wayne for the hockey stick.

As Jon redescends, his ankles rise. I pin them again. Jon works hard and breathes hard. When he needs air, he first clears his snorkel's blowpipe. Spray drifts over us. When the whale needs air, it clears its own blowpipe—sometimes whinnying like a horse, sometimes snorting like a bull. Spray pours onto us.

As Jon tugs at the netting on the whale's chin, the work finds its rhythm. Jon blows; whale blows; Jon blows; whale blows. This could go on for hours.

I hang onto Jon's ankles and on his every word—yelled at Wayne and me through his snorkel. When the snorkel blurts "Ol' on," I hold harder onto Jon's

ankles. When it blurts "Uck"—and at the same moment I see the whale cock its tail, giving us what amounts to a fly's-eye view of a flyswatter—I duck, getting my head below the gunwales. (Earlier, Jon assured me that only one time in ten will a whale actually "strike"—but then its tail comes as fast as a horse's kick.) When the snorkel blurts, "Eez, 'e's comin'," I'm stumped.

I yell at Wayne, "What's he say?"

"He says," Wayne explains, deadpan, "he sees his cousin."

Naturally Wayne is calmer than I. This is my first trapped whale; Wayne's been aboard for two others. Fortunately for all of us, the man whose ankles I've been clinging to has saved more whales than anyone else in the world—hundreds of them.

Freed whale surges away from rescue boat toward open water. Floats at right are attached to cod trap.

Lien (center) and helpers monitor whale's progress. Summer icebergs are not unusual off Newfoundland.

When I arrived at Jon Lien's laboratory in the wooded hills above the provincial capital, St. John's, on the day before the Folletts got their whale, he made me feel welcome in true Newfoundland fashion: he told me not to waste money on hotels. I should stay at his guest cabin as long as I wanted, just uphill from his house and past the barn where he and his wife, Judy, keep their goats and turkeys.

As we sat at a picnic table that he called his "office," I noticed that Jon, now in his early 50s, looked like the territory he lived in. His hard-worn running shoes were the color of Newfoundland granite. Lapping over them were denim jeans the hue of blue ocean. Above the blue, he wore an evergreen-color pullover. His beard was a grizzled gray-blond, like lichen, and his blond hair was flyaway, like the wispy needles of tamarack. Just one item looked odd: a black beeper, hung on his jeans, set to wail whenever a fisherman snagged a humpback and phoned for help.

At the same time Jon made me feel welcome in Newfoundland, he also made me feel awful. He predicted a "great" whale season—which to him meant almost no whales at all.

Jon Lien didn't come to Newfoundland to save whales or even to study them. He came in 1968 from the United States, where he had grown up on farms in South Dakota and earned his doctorate at Washington State University, to teach animal behavior. His specialty was a palm-size seabird, the storm petrel.

Then in 1978 a fisherman called Memorial University to ask for help. He had already asked everyone he could think of, including the government fisheries office. He had a problem no one knew how to solve. A humpback whale had snagged in his gill nets. It could not rip loose. It would not die. Its bones were becoming visible under its skin. It had been snared for three months.

Jon Lien took the call and found a way to free the whale. Soon, fishermen swamped him with similar tales of woe: trapped whales, lost fish, dead whales, ruined gear. He was able to estimate that about half of all trapped whales eventually died—occasionally at the hands of fishermen who had no one to help them.

He talked the government into modest funding ($15,000 per year, recently raised to $50,000) for a university research project and started saving whales. In the next dozen or so years, he and his assistants took part in the release of more than 600 humpbacks.

A few decades ago, there may have been fewer than

The professor who rescues whales

Lien attaches an alarm to fisherman's net. Submerged device makes a noise that alerts whales to hazard.

6,000 humpbacks left in the world. Humpbacks may be the most gregarious of all large whales, often gathering near shore and, for that matter, "singing" to each other in a complex concert that, since it was first studied in the 1960s, has entranced human listeners—many of whom first heard humpbacks singing as an accompaniment to Judy Collins in the haunting whalers' song "Farewell to Tarwathie."

The humpback is surely the most acrobatic of large whales, often making itself conspicuous by leaping from the water in dramatic breaches, by lunging up out of the sea to feed on baitfish, and by slapping its flukes or its winglike pectoral fins against the surface with a wallop that can resound for miles. Its conspicuous behavior, combined with its relatively slow swimming speed, made the humpback easy prey for whalers. Its numbers fell from a total of perhaps 150,000 worldwide to the verge of extinction when commercial whaling of humpbacks finally ended in the 1950s and '60s.

When the whales head north to feed

Since then humpbacks have rebounded slightly. They may number some 12,000 individuals divided into mostly small populations throughout their ancient range. Groups of a few hundred feed in summer at five separate locations around Antarctica, for example; perhaps 350 feed near Greenland, at least 400 near the Gulf of Alaska, and another 400 or so off Maine.

In all the world, however, the humpback population that seems to be most solidly rebounding is the one scientists call the "feeding substock of Newfoundland-Labrador." That substock now numbers 3,000 or more, and when it heads north to feed at midsummer along the Newfoundland shore, it's whale season.

Each year for the past half-dozen (and generally since records began to be kept at the end of the 1970s), more and more humpbacks have been hitting the nets of small-boat, low-income, inshore, family fishermen like Fred and Ambrosene Follett: 34 caught in 1986; 66 in '88; 75 in '90—an all-time record. (These numbers dwarf statistics elsewhere: off the entire Northeastern United States in the decade ending in 1985, an average of fewer than two humpbacks per year were reported tangled in fishing gear.) In addition to Newfoundland's rebounding whale population, the causes may include an increase in fishing gear near shore and a decrease in baitfish offshore, possibly as a result of large-scale fishing.

But 1991, Jon Lien told me happily, would break the trend. This season, he predicted, fishermen would not suffer a plague of whales. Instead, this summer, the coldest in memory, would be remembered as iceberg season. Even after midsummer, icebergs were jamming harbor mouths and grinding along headlands.

Fishing crew hauls in cod traps on a misty day near Gaskiers. Pulling up sides of net traps the fish, leaving them no escape. Netting of one trap costs $5,000. Damage caused by a "whale hit" could ruin a fisherman.

The ice-cold water, Jon predicted, would keep away the capelin that are the primary baitfish for both cod and humpback. And although Jon worried for the fishermen, he seemed to exult for himself. Just this summer, instead of freeing whales, he would "un-entrap" himself. He would do what a university professor should do: write articles and supervise graduate students.

Early the next morning in Bay Bulls, an hour south of Jon's lab, half a dozen sleepy-eyed graduate students clustered around him to discuss their research project, the impact of Newfoundland's fledgling tourboat industry on the island's full-fledged seabird colonies—myriad pullulating puffins, kittiwakes, murres, gannets and razorbills.

Then the beeper unleashed its whale wail. A fisherman named Follett had called from Grand Bank.

"We've got some whales," Jon announced. His eyes took fire. His students seemed to melt away. He phoned Fred Follett in Grand Bank: keep boats away from the whale. He phoned Wayne Barney at the lab: prepare the inflatable whale boat. We jumped in Jon's little blue Mazda, the whale truck.

As Jon drove he talked—but not, to my surprise, about saving whales. "I'm working for this fisherman," he began, and at speed he sketched the life of Fred Follett, a man he had met before only briefly. "I pretty well know the situation: nothing's happened, he's had a rotten year, got no money.

"Capelin have just come in," Jon continued, meaning cod would follow—bringing the Folletts one chance to make good money. "And here he's got a whale. This guy is facing the wolf at the door. Maybe he's got a week left to make his living."

In a typical year around Grand Bank, a fishing family like the Folletts earns only about $8,000. Of that amount, half might come from cod. A season with no cod catch and the loss to a frenzied whale of their one cod trap—a vast boxlike enclosure that requires months to build and contains some $5,000 worth of netting—could leave a family with no money whatsoever.

Fred Strebeigh, who teaches writing at Yale, grew up just outside of New Bedford, Massachusetts, the world's largest whaling port during the age of sail.

Hanging over bow of boat, Lien reaches down to tie a rope around the pectoral fin of a humpback found dead in water. Rope is used to tow carcass ashore.

At the wharf in Grand Bank, the Folletts stood in their foul-weather gear—Ambrosene with a wide, freckled face, and Fred with a meticulously trim auburn beard. They looked worried but calm, like family farmers with a sick milk cow, relieved to see the vet.

As Fred skippered us out toward the whale, Jon knew what to expect—a young male humpback, 1 to 3 years old. He was right. To Fred he said, it's "always small guys who make mistakes."

Young humpback males, Jon often says, are like "teenage drivers," with one possible exception—they're too smart to crack up twice. Net entrapments leave whales with distinctive scars, and Jon almost never sees a trapped whale carrying old net scars.

As it happened, the Folletts were lucky with this reckless young whale. In less than an hour, mostly spent staying away from the tail (it never struck), Jon worked the net almost free. Suddenly, with a tug, the whale was loose. It whipped across the bay, gulping air, and then plunged for the depths. The uprush of water from its flukes created a flat "footprint" on the surface, vast as an Amazonian water lily.

"Nothing I could do to hold him," Jon told the Folletts, as if apologizing. Their net damage, he told them, looked slight—maybe a day of patching. Jon offered to start the patching right then; firmly but gratefully, they refused. Next, however, he made an offer they did not reject: he would equip the battered net with his new "whale alarms"—noisemakers, designed to warn whales away from nets, that draw on a dozen years of Jon's trials and errors.

Earlier efforts had their flaws. Old fishing lore, for example, said whales wouldn't swim near whale blood: wrong, Jon learned. Old antisubmarine tactics suggested whales wouldn't swim toward depth charges: right, Jon learned—but encouraging fishermen to toss submersible firecrackers between whales and nets was potentially dangerous to both man and beast.

Jon refined the most promising tactic: place noisemaking "alarms" to warn the whales away. The prototype looked like a gleaming aluminum volleyball and held a mechanical clanger that switched on automatically when the alarm hit salt water. Alas, half a dozen, enough to protect one trap, cost more than $1,000. But these prototypes weren't for sale; they were free, on loan as part of an experiment. Once word spread around the docks that the new alarms worked, fishermen began lobbying for them.

As Jon strung alarms along the Folletts' net, they began to clank—making an industrious clatter, the sound of elves hammering horseshoes. To a whale, he told Fred, "that sounds like a wall of sound."

Back at the dock in Grand Bank, Fred said thanks for getting the whale loose. "You've caught your quota," Jon told him. Wayne added: "Catch any more, and we fine ya." The whale truck was off.

As Jon drove, the passing scenery jogged his memory. Each inlet and outport had witnessed its whale crisis. The map of Newfoundland seemed as dotted with trapped whales as the wreck charts of Cape Horn are with smashed ships.

Just west of Grand Bank, there was the stranded pygmy sperm whale on the island of Miquelon. Just south, there was the pilot whale stranding at Point au

Lien calls signals from boat (left) while men haul whale closer. After cutting through skin and blubber, Lien removes heart (above) for medical research.

Gaul. "We don't do heroic measures when they strand," he said, lest I confuse his rescue efforts with the media-enhanced drama that occasionally ensues when whales hit beaches elsewhere.

When a lone whale strands, the cause is often illness, he observed, so "putting it back in the water probably is just a good way of spreading disease." Furthermore, "strandings are a natural phenomenon," one that whale populations have adjusted to "over the centuries." His goal is to stop "new mortality"—such as snagging in nylon nets.

Other parts of the coast had other whales. Near Gaskiers, a violent humpback had to be pulled into the shallows with a long rope tied to a backhoe. Once the backhoe had hauled the whale in, Jon cut the net in minutes and then chased the creature back to sea.

In Conception Bay a sperm whale was reported "behaving strangely." But when Jon tried to help it, it dashed away.

Off St. Vincent's a massive right whale—weighing perhaps 70 tons—snagged in a cod trap and, when Jon arrived, turned violent, striking wildly. Jon got a fisherman with a 55-foot boat to winch its tail out of the water so Jon could cut the net. The whale lifted the boat so high that Jon, on the water in his inflatable, saw daylight beneath its keel. The boat owner cut the winch line. The whale departed with the trap.

Back at the lab the next day, whale dramas seemed only memories. All was calm. There was pea soup in the Crock Pot. There was Taster's Choice in the Coffee Magic. There was Jon and Judy Lien's farm-fresh goat's milk in Mason jars in the fridge, beside—also in Mason jars and saved for a graduate researcher—whale eyes the size of large onions.

Predictions resumed for a great, whale-free season. The next day also began calm. Then the phone rang.

Whale season had apparently reached Trinity Bay, not far north of St. John's. From its low-humped hills, themselves the shape of swimming whales, families could look down on chill mornings across a sea made spouty by the warm breath of whales—fins, minkes, humpbacks. Trinity Bay was looking as thermal as a geyser basin in Yellowstone.

When Rex, Orlando and Howard Roberts in Whiteway, at the south end of Trinity Bay, heard they'd caught a whale, they weren't surprised. They didn't even go to look at theirs. First, Rex Roberts called Jon Lien. Then Rex and his brothers, a fishing team for a dozen years, sat down on the docks to wait. They looked like a line of forwards on a local hockey team: Rex the solid center, his brothers the lean wings. Just now, though, they looked benched.

Sometime before the whale truck arrived, a "Big Red" all-terrain tricycle pulled onto the docks. Its rider called out at Orlando Roberts, "Ya got whale, eh?" The voice was taunting, the accent thick. "I 'ope 'e's dead—get a meal, anyways."

The voice belonged to Scott Jackson, 23, broad-shouldered, well-tattooed. "I knowed somebody was gonna catch one," Jackson continued, maybe for my benefit (I had driven early to Whiteway). If he ever caught a whale in one of his nets, he announced, "I'd like ta kill it." He actually licked his chops and then added: "Ar'tic steak—better 'n cow."

Crewmen guide basket unloading a good catch of cod from nets. Cod is the mainstay of the local economy.

I didn't know what to make of Jackson, but Jon Lien had warned me I would meet his type: the voice of the devil, or at least the devil's advocate, vowing the best whale is a dead whale. In Whiteway, however, devil's vows had no audience. As Jackson talked, other fishermen drifted away. Perhaps they knew what he would do next: brag about shooting a whale.

It had happened in 1978, just a few months before Jon Lien saved his first whale. In late June that year, a humpback snagged in Hayward Legge's net at Shag Rocks, a craggy outcrop visible from the Whiteway wharf. Legge didn't know what to do. There was no one to phone for help. Old fishermen told him that a whale, left to die slowly, would tear his net to bits.

Legge and most of the fishermen of Whiteway went out in four or five boats to Shag Rocks, carrying rifles and 12-gauge shotguns. They couldn't free the whale, so they decided to kill it quickly.

A bit after hearing Scott Jackson's boasting, I went to look for Hayward Legge at his house, just uphill from the Whiteway docks. When he answered the door, he looked at me as if I were a federal marshal. His eyes, deep blue under brows as craggy as Shag Rocks, seemed to say, "I knew you'd come for me someday."

He talked sadly about his whale. "Old fellers," he recalled, "said, 'Mind, go kill 'im roit quick,' so he wuddn't tear up much gear." The old fishermen also told him to "foir down 'e's blowhole." Legge winced as he talked about it. He would fire; the whale would descend; the whale would rise to breathe; he would fire again. Blood filled the water. The whale wouldn't die.

Hayward Legge is a skilled hunter. Like most Newfoundlanders, he hunts for the pot: moose, caribou, partridge and other game to keep his family fed. And like most hunters, he is someone who cares about clean kills. The largest room in his house is decorated with paintings and drawings of animals in the wild—auks, puffins, deer—many done by his nephew. It also contains meticulously stuffed examples of owl, murre, puffin, seal and moose, most of them prepared by Legge himself. The stuffed creatures show damage to neither fur nor feather.

The whale, he said, was the worst hunting of his life. "Oy'd say it was prob'ly two hours" of shooting, he recalled, looking disgusted. "Hard animal to kill."

Would he ever kill a whale again?

Oh no, he said. Two years later, in 1980, he caught another whale near Shag Rocks. That was different. He didn't get his gun. He got his phone and called Jon Lien. That whale got saved.

When Jon Lien reached the docks at Whiteway to help the Roberts brothers with their whale, Scott Jackson seemed to fade away. "If I can't get a decent meal off 'im, I'm not gonna watch," he spluttered. When he left, the Roberts brothers looked relieved.

As Rex Roberts skippered us out toward their trap, he told me they had "never tangled with whales before." Nor would they tangle with one this time.

"It's just wavin' us goodbye!"

When we had motored to within a few hundred yards of the trap, we suddenly saw a whale. It was dashing away from us, traveling as only a humpback can. Its tail was waving so high out of the sea that the whale seemed to be standing on its head, held aloft by wings—the humpback's enormous pectoral fins. Out in the middle of the bay, its upraised flukes swayed like a lone palm tree in a hurricane.

We found the trap empty. The Roberts brothers' big one had got away. They smiled ear to ear.

"See 'im go?" asked Jon. "Fast enough for ya?"

"That's good service," said Rex, turning to yell at the fleeing whale. "Good luck!"

"It's just wavin' us goodbye!" he added, laughing, and then began to check for net damage. The whale had destroyed only 60 feet of trap—just $100 lost and a day of patching.

Not every Trinity Bay whale got away that day. John

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Buckle up, America!

Returning from an emergency call (above), Lien tows boat past a mural of humpbacks on road south of St. John's. Back home (left) he relaxes outside his barn with goat and Newfoundland dog, Jenny. A professor of animal behavior, he grew up on a farm in South Dakota.

Ralph caught one late at night near Bellevue. By dawn it had died.

With Ralph's help, we towed the whale to an island of rock and guano, populated only by thousands of black-backed gulls. Out there, Jon Lien decided, he could partly dissect the whale to help a team of researchers who needed measurements of whale hearts. Also, lashed to this remote island, the whale would pose no risk to human health or passing ships.

The scene of a young animal, alive until it blundered into his nets and now spread for gulls to peck at, seemed to offend John Ralph more than anyone else present. "We're just feedin' the gulls is all we're doin'," he said. "It's a total waste." He shifted to talk about other waste: capelin he catches and has to discard because Japanese shishamo cooks want only females full of eggs; herring he catches in springtime that can't be sold if the market gluts.

"Hundreds and t'ousands in the world starvin' to death all day long," he said, looking back at the whale. "If they had that whale many places in the world roit now, they'd make soup of the bones, that's fur sure."

John Ralph's whole heritage was fishing—checking gear with his father in the mornings before going to school, building his own fishing boats as his father and grandfather had, setting nets along a coast that steadily since the early 1500s has supplied fish to markets as remote as Europe. Such waste seemed to strike at lifetimes of catching fish and feeding a hungry world.

A few days later, driving in the whale truck, Jon Lien got talking about whales, and waste, and the work of inshore fishermen like John Ralph. "I sort of get nervous when we're catching whales," he said. His great fear is that an environmental group might start a campaign against Newfoundland fisherfolk. "These guys are vulnerable as hell," he said. "You know a humpback is better loved than they are."

But from an environmental vantage, he argued emphatically, "these are the guys we need to encourage and protect." Compared with offshore fishing fleets, inshore fishermen don't waste gas, and they don't waste fish. While the offshore fleet may burn fuel as extravagantly as one pound of fuel for each pound of fish it lands, he pointed out, "these guys get along on a can of gas for a week."

"There are 360 million fishermen worldwide," he continued, "and almost all of them are these guys that putt out in the morning, putt home at night." Viewed economically, their work looks rotten, "but the environmental aspects of their fishery look great."

Lien's goal now is to increase support for small-scale fishermen, at least by perfecting alarms that will allow whale and man to coexist on the Newfoundland shore. Such support can be scarce. When the government refused to help him build alarms, for example, he turned to a private company and, as he told a gathering of Bellevue fishermen, "those guys like bucks." Still, he hopes mass-production can bring the price of a half-dozen alarms down to below $200.

For Lien, an effort that began with saving an endangered species seems to have expanded to preserving an endangered way of life. During my last week in Newfoundland, both needed help.

All around us, whale season was coming in. Whales crashed into gill nets at Red Harbour and Hermitage. Whales hit a salmon net at Brigus South and broke through a cod trap at Pouch Cove. Whales ran off with gill nets from Fortune and, two days in a row, from Grand Bank.

That same week, the whale truck hit the road almost

every day. Albert Rome and his son caught a whale in Chance Cove. Then Baxter senior caught one off Red Harbour. Then John Ralph caught one at Bellevue, his second whale of the season. (After Jon and Wayne got this one out alive, John Ralph was gracious: "Come back someday for a barbecue," he said, "but not for a whale.") Then the Barrett family caught one off Fermeuse. Then somebody got one at Red Island. Then the Sullivan brothers had one near Calvert.

At each outport, fishermen asked Jon Lien about whale alarms. With each whale, fishing families lost hundreds or thousands of dollars. With each day, Jon and Wayne looked a bit weaker—like a wrestling team on a bad road trip.

My last day in Newfoundland, whales seemed stacked in a holding pattern: one waiting for Jon and Wayne at Point La Haye, another at Bell Island, and more coming. My last rescue was the Sullivan brothers' whale at Calvert, and on the boat ride out we were joined for a brief visit by a documentary film crew.

The filmmakers were all glamorous Britons, but their on-camera star was an owlish-looking American. He wasn't there for looks. He was Roger Payne, probably the best-known whale researcher in the world (and the man who, long ago, recorded the whale songs that accompanied Judy Collins).

As we putted past icebergs and pulled on foul-weather gear, Payne talked about Lien: "There are dozens of conservation organizations claiming to save whales, but except for a few, Jon Lien has saved more than any of them."

Not long after our conversation, the Sullivans' whale was swimming free, and my plane was flying home. Later in the summer I phoned Jon's lab a few times, but he was always off on a whale.

Just after New Year's, he sent me a note. Humpbacks had hit like never before. Jon estimated the total number of whale collisions with gear at 1,280, with a cost to fishermen of close to a million dollars. All told, 137 humpbacks were reported trapped in gear—up from the previous year's record of 75. Fifteen died, but 122 survived. The year's last humpback banged into a squid trap in Whiteway in late October. It was the biggest whale season ever.

A gamboling humpback dives in the clear waters of Trinity Bay. By releasing whales from nets, Lien hopes to preserve the small-scale fisherman's threatened way of life as well as a majestic but beleaguered species.

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By Richard Conniff

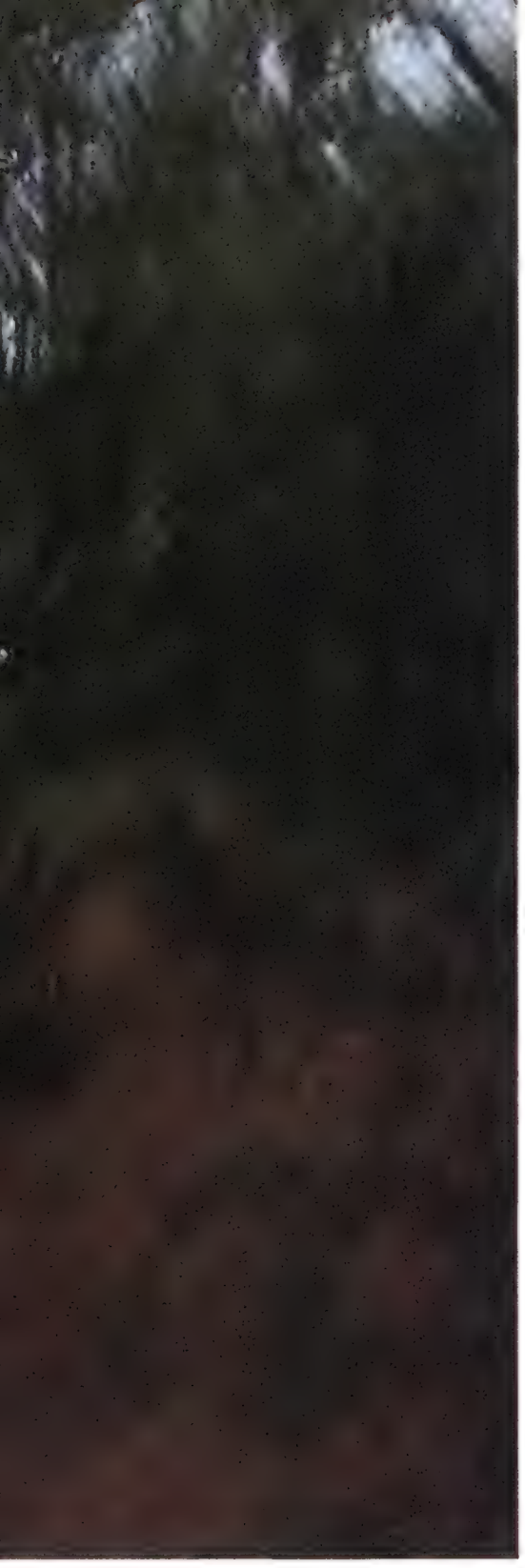
To excel at 'O,' study the map and run like hell

Orienteering is called the thinking sport because mental concentration and quickness give you a leg up over physical strength

"Has someone explained these hieroglyphics to you?" a kindly woman asked, as a group of us huddled around a slip of paper that a race official had just taped up on the side window of a parked car. The others were frantically copying the hieroglyphics onto little cards, like high school students making chit notes for the big algebra exam. The event we were about to attempt was an orienteering sprint through a wooded area in West Chester, Pennsylvania, and I had a horrible sinking feeling that this mess of cryptic little squiggles and circled Xs was going to be vital for getting through the next couple of hours alive.

"Not yet," I replied tentatively, restraining an unmanly urge to tear at her sleeve and beg.

"Oh, it's not that complicated," she began. The numbers on the left, from 1 to 17, represented "control points" I would need to find and pass through to complete a 3.2-mile course through the woods below us



A study in motion, this contestant at a recent orienteering event in Florida carries a map and compass as he dashes through dense brush searching for the next control point.

before dark. The symbol next to each number indicated the topographic feature where I would find the control, with the help of a map. This symbol here, for instance, which looked to me like the smile on a "smile button," actually stood for "small depression," she said, and this one here, vaguely resembling a featureless Casper the Friendly Ghost, was a topographic formation called a "reentrant," a small valley or indentation. At each control, there'd be a kind of paper punch hanging near a small orange-and-white flag. The idea was to mark the appropriate space on my card with the Braille-like pattern of the punch, to prove that I'd been there, then run like hell to the next control and punch in again. It was about ten minutes till the start, when we would get to see the course map for the first time, and maybe an hour and a half till dark.

I was about to ask her to tell me again if a black triangle stood for a boulder or a previous fatality, when someone began to call out map changes in an official voice. "There's a swamp. I'm not going to tell you where it is," he advised, with a grin.

"It's crossable?" a guy in a "Trail Animal" T-shirt inquired.

The grin widened: "But thick."

I began to wonder if I ought to have done my homework after all. What I knew about orienteering, the sport I was about to undertake, was slightly more than the average red-blooded American, which is to say, almost nothing. I'd mentioned casually to my father that I was planning to try orienteering. "Isn't that the sport," he asked, "where people follow a map through the woods using a compass and a slide rule?" My mother called back a few days later to ask when I was going off "Osterizing." No, Ma, I said, that's a different sport, where you start by putting the map in a blender with some banana daiquiri fixings and too much rum. My kind of sport.

Why orienteering is important

But maybe I was being too flip. Perhaps orienteering is something the average red-blooded American ought to know more about—especially the millions of us who at this very moment are hurtling down the wrong freeway and peevishly asking our spouses, "Can't you even read a damned map?" Orienteering asks the same question, which goes to the heart of our national shame.

We live on land explored by men who were willing to travel thousands of miles into the unknown with only the most rudimentary of maps or none at all—Lewis and Clark, John Wesley Powell, John Charles Frémont. Yet most of us dread so much as unfolding a map because of the certainty that we cannot even figure out how to refold it afterward. We ought to know a little more about orienteering if only because we get our national identity from a mapmaker of sorts, the accidentally eponymous Amerigo Vespucci.

That said, it must be added that orienteering isn't even remotely an American sport. The Swedish and Norwegian armies appear to have originated competitive orienteering in the 1890s with rudimentary field tests to see who could get from point A to point B across a familiar piece of countryside fastest. One history includes among early meets organized along roughly modern lines a relay ski-orienteering event from Bollnäs to Härnösand, Sweden, a distance of 109 miles, umlauts included, on March 4, 1900. Inauspiciously, the winning team took 28 hours 27 minutes to finish, in the thick of a blizzard.

Sweden remains the spiritual center of orienteering today, and major meets rate front-page headlines and aerial photography. The sport has also won a passionate following throughout Scandinavia, Eastern Europe,

Photographs by Enrico Ferorelli

The sport that makes you think

Checking in upon arrival, contestants register, get area maps and find out about their starting times.

Mom, dad and two daughters, preparing to compete in family event as a team, copy master map of course.

the former Soviet Union (where 500,000 people participate), the British Isles, Australia and Japan, where bicycle orienteering is popular. Even Hong Kong has an orienteering club, which brings us to one of several misconceptions about the sport: though sometimes referred to as "forest games," orienteering events don't technically require a forest. They can occur anyplace susceptible to mapping, including city streets. Nor do they necessarily require arduous legwork. Orienteers have practiced their sport with almost every form of locomotion imaginable, from wheelchairs to scuba gear. Despite the sport's nickname, "cunning running," walking is also permitted. A few devoted, or perhaps deeply conflicted, souls have even attempted orienteering meets inside shopping malls, using trivia questions instead of paper punches for controls: visit the third store on the left in the southwest corridor, second level, and ask at the hobby counter for the price of the solar-heated doggie waterbed. In orienteering, known affectionately as "O," this variation is called Shopping Mall-O.

Do we thank or blame the Swedes?

My father to the contrary, orienteering also doesn't require a slide rule. At the entry level, it doesn't even require a compass. But that technical image may partly explain why the sport has never quite caught on in at least one country, the United States.

Orienteering arrived here from Sweden after World War II, in the person of Bjorn Kjellstrom. Now 81, Kjellstrom (p. 48) is still lean and boyish, with tawny shoots of hair arching over his forehead like blades of grass. He hikes the countryside around his home in Pound Ridge, New York, with a ski pole in one hand now, a concession to the infirmities of age. His business card declares, "Magnetism has shaped my life."

He and his brothers were champion ski orienteers in Sweden in the 1930s, when the tools of the game included a topographic map, a compass in a wooden box with brass hinges, and a protractor. The Kjellstroms and a partner came up with the idea of combining compass and protractor, and founded a company named Silva (from the Latin for "forest") to produce a compass that rotated within a baseplate of transparent celluloid (nowadays, plastic). Set directly on the map, the baseplate compass made it much easier to establish and maintain a precise direction of travel, and played a large part in popularizing orienteering throughout Scandinavia in the 1930s, with unanticipated results: a knowledge of map and compass was one reason the Finns were able to outmaneuver and, for a time, repel Soviet invaders in 1939. It also helped Norwegian resistance fighters escape to Sweden after the Nazi invasion of 1940.

Kjellstrom introduced the sport to the American

One orienteer punches his card at a control point marked by flag and letters while other contestants run past. It's not smart to follow somebody else. Who knows? He or she may be competing in a different race.

public in 1946 as a way of promoting the Silva compass. Working with the Boy Scouts, he toyed with the name "pathfinding" but in the end merely added an *e* to the Swedish word *orientering*, meaning "to orient," to echo the more active sound of "mountaineering." Because of the close identification with Silva, orienteering developed in this country largely as a compass game, a source of chagrin to modern promoters of the sport. "I get this every day," says one. "People think orienteering is nothing but compass games: go 45 degrees for 60 paces, and then 90 paces at 60 degrees." Most orienteers now downplay the compass and emphasize map reading instead.

Kjellstrom himself is gracious about this shift, readily acknowledging that the complicated appearance of the sport is largely to blame for its failure to thrive here. In 1990, only 38,000 starters went out on events sponsored by orienteering organizations. This is an astonishingly small number, almost in a class with such sports as tossing the caber. If they have heard of it at all, most Americans still think of orienteering as a sport for those who know how to follow compass bearings and adjust for the effects of magnetic declination while jumping off cliffs into briar patches—not, in short, for them.

I wasn't sure it was for me either as we waited at the starting line. "Most of the orienteering we do is much less adventurous than you might think," a longtime orienteer named Peter Gagarin had assured me. "We don't drop people out of a plane with three matches and say, 'Come back in three days.' You're out for an hour or so, and most often you're in places that are civilized. We pick areas where people can't get lost too badly." My doubts about this had to do with little things, like Gagarin's other hobby, running ultramara-

Richard Conniff, who never ventures far from his home in Connecticut without a map, wrote about cormorants in the July 1991 issue.

Bjorn Kjellstrom, the grand master of orienteering in North America, holds model of compass he invented.

thons, and also perhaps with the sign-up sheets at the registration table—there was one for Sprint-O, this evening's event; one for Night-O, in which you bash through the woods in the dark; and one to tour the Chester County Orthopedic and Sports Physical Therapy Center. "Sharpen your elbows," someone on the starting line remarked. An official cried "Go!" and 50 people flipped their maps and started moving, hesitantly at first, then in a mad stampede uphill.

Standing in their dust, what I noticed first about the map were the pretty splotches of color. As on any topographic map, wavy, light brown contour lines spread out like ripples. "The contour lines that are close together mean a steep rise," an instructor had told me earlier in the day, as we huffed our way up the embankment in question. "And this dark green area here means impassable forest." Tonight's map consisted of broad white patches for open forest, a block of gold for the grassy athletic fields of the adjacent college campus, and intermittent green patches designating thick, very thick and impassable forest, all speckled with a wealth of topographic detail—the inscrutable squiggles and Xs. On the road atlas I'd used to drive here, drawn by Rand McNally at a scale of 1 inch to 735,510 inches, the entire town of West Chester was a dot. But a typical orienteering map is drawn specially for the sport using a scale of 1:15,000, or in this case, for added detail, 1:5,000. Some of the dots even stand for individual lampposts.

I couldn't, however, find any place on the map that said "You Are Here." Then it dawned on me that the overlay of straight red lines connecting numbered circles was the 3.2-mile course. I found north on the map and lined it up with my compass, so that the map began to correspond vaguely with the real world. Then I ambled off toward control No. 1, using the trampled undergrowth as my guide.

In the sport of orienteering, it quickly becomes apparent that the essential question is not compass bearing but route choice. There are almost always several different ways to get from one point to another, and the beeline on a direct compass bearing over a mountaintop is seldom the best. Indeed, orienteers tend to disdain beelining over obstacles as a brute-force approach; they aspire to intellectual finesse. If climbing 20 feet in elevation eats up the time and energy it would take to travel 250 feet on level ground—the sort of quick calculation orienteers are always making—then it may be smarter to follow a prominent contour along one flank of the mountain, or even to stick to the safety of a trail looping around the base.

Whereas compass bearings can be essential on a standard, bare-bones topographic map, the wealth of features and the relatively short distances traveled make them superfluous on most orienteering maps. To keep from getting lost, or as they prefer to say, "disoriented," orienteers aim for a prominent feature near the control, called an "attack point," with a "catching feature" beyond it to prevent overshooting—the equivalent of saying, "Turn left when you get to the gas station. If you pass the supermarket, you've gone too far."

Always keep an eye out for shortcuts

Bizarre route choices have a special intellectual éclat, at least if they work. In a canoe-orienteering event near Concord, Massachusetts, two competitors studied the route of the Assabet River and quickly calculated their mileage per hour with a paddle versus on foot. Then they hauled the boat out of the water, shouldered it and ran two miles down Route 2, bypassing a four-mile bend in the river and incidentally thrilling tourists caught in traffic on the trail of a sometime mapmaker in the neighborhood, Henry David Thoreau, who once wrote, "Not till we are lost . . . do we begin to find ourselves. . . ." That artful maneuver won the race.

For the novice orienteer, the most frequent route choice is to follow somebody else, which is technically against the rules and can also backfire. Orienteering courses tend to crisscross back and forth over a relatively small piece of terrain, so the person ahead of you may be running for a different control or even on an entirely different course. "It's kind of like following the contrails of another jet across the Atlantic," an L-1011

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Youngster copies route from master map for String-O event, in which participants follow string on ground.

pilot who uses orienteering to help stay in shape told me, "and you find out when you get to Canada that he's going to Mirabel in Montreal and—oops!—you're going to Kennedy."

I took a chance and cheated anyway, because the map made no sense to me. Following the laggards at least gave me the chance to place myself in the terrain and tick off the features as they crept past: road followed by wide trail followed by boulder field. If it was like flying an L-1011, then I was doing so at ground zero and with my head out the cockpit window in search of landmarks: give me a contrail to follow and any damned airport would do.

Gradually, though, as I punched my course card and gathered confidence, I began to decipher the language of the map and to understand the puzzlelike gratification in following its lead. I struck off on my own and started to run. Soon I should hit a trail, then a power line (glance at the map) then another trail with—bingo!—control No. 7. No. 8 should be a little farther on at the top of a shallow reentrant, where I found it—boo!—in roughly the position of Casper the Ghost's nose. Excitement was making me giddy. The setting sun spattered the undergrowth with badges of orange light almost identical to the orienteering control markers. People sprinted in every direction through the woods, appearing and disappearing like characters out of *A Midsummer Night's Dream*, only more purposefully. At any moment, I expected Puck to swing down off a branch and cry, "How now, spirit, whither wander you?" Instead, a puffy, white-haired man jumped down an embankment, tore off his shirt and yelled, "Quick! Check my back! Sumpin's bitin' the hell outta me." I checked his back and, just as suddenly, he bounded away into the brush, eyes fixed on his map.

"Orienteers have very good demographics," Sara Mae Berman told me out of the blue one day, introducing herself as copublisher of a magazine called *Orienteering North America*. They own their own homes and cars, she said, and 60 percent have incomes over $50,000. Orienteering requires new terrain and new maps to keep it interesting. Orienteers need discretionary income, to be able to travel to far-flung events.

Orienteers also tend to be older—erstwhile boom babies going gray at the seams—and remarkably well-educated. All but 4 percent have completed college, and more than half have earned graduate degrees. At least one orienteer I met, Berman's husband, Larry, was a former aerospace engineer, and the woods were rife with other engineers and computer analysts.

Ordinary folk might not always be able to comprehend the small talk, but even so it was pleasant to contemplate in an abstract way: Where else in the athletic world would the chatter tend to subjects like nuclear fusion and theories of the surface tension of bubbles? Where else could a guy gather a crowd around his laptop computer by announcing that he had acquired hot new orienteering software from Lithuania?

Orienteering has been called the thinking sport, and most orienteers seem to have adjusted happily to an image one of them described as "not nerdy, but techy," though here and there I caught lingering hints of touchiness. A woman complained one day about a recent article depicting orienteers as tall, skinny fanatics dressed in expensive warm-up suits. In truth, the people around us were a more or less ordinarily lumpy sampling of humanity, and the woman's orienteering slacks had been torn and restitched so often she looked as if she had been harried by crazed wood nymphs wielding seam rippers.

"A bug crawled into my map case"

Others have resigned themselves to the appearance of fanaticism, which may be inevitable for anyone who chooses to hurtle through the woods in rubber-studded shoes, "bramble basher" shinguards and baggy suit of briar-resistant ripstop nylon. Some of the orienteers I encountered wore baseball-batting gloves for grabbing thorny branches. Others had a massive magnifying glass strapped to the thumb on their map hand, or a jeweler's snap-down loupe on their brow, the better to decipher cryptic symbols on the run. ("I would have done better," says one orienteering T-shirt, "but a bug crawled into my map case and I thought it was a cliff.") Together with the treasure-hunt intensity of orienteers, the effect on the unforewarned can be startling. Out

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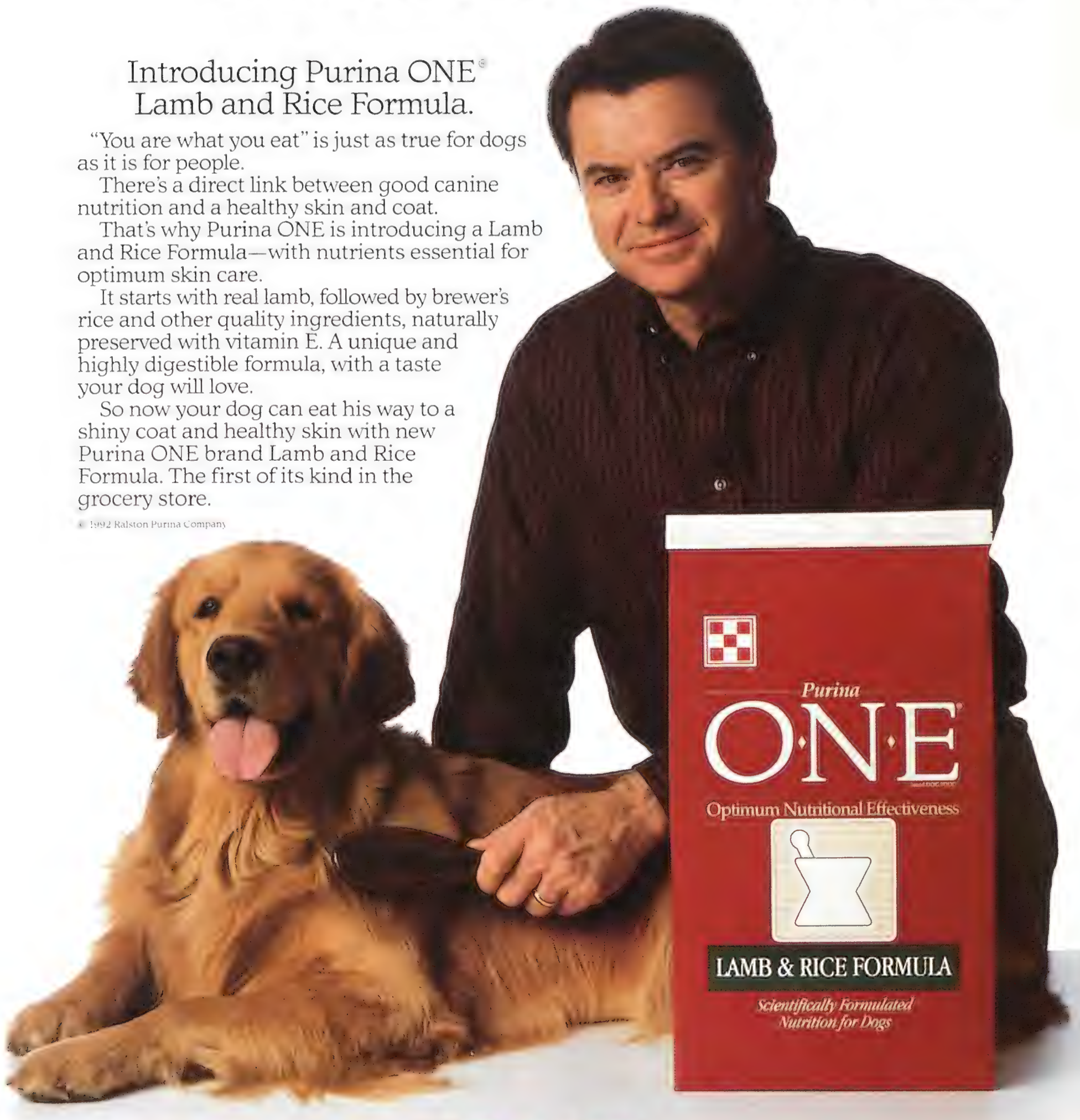

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canoe-orienteering on the Charles River in Massachusetts one day, contestants descended on a fisherman chucking out line in a quiet cove. "Were you having fun before the orienteers got here?" I called.

"Is that what's going on?" he replied, bleakly. "I could've gone to a 5-K race today, but I thought I'd get away from people."

In a bid to make their sport seem somehow more normal, some orienteers liken what they do, improbably, it might seem, to golf. "At work, they think I'm a fanatic," says Aims Coney. He has toyed with the idea of organizing a Western Hemisphere Affiliation of Canoe and Kayak Orienteers—WHACKO, for short—but he also says, "I'm not a fanatic. I just know what I like." The colleagues who kid him, he says, "are the same people who leave work at 4 o'clock to play golf." Gagarin, the ultramarathoner, suggests that a course of 12 or 15 controls is not much different from an 18-hole golf course—only woodsier and somewhat scrambled. Except in a few mass-start events like Sprint-O, orienteers also have the equivalent of tee-off times and head out at intervals through the day (the shortest elapsed time usually wins). Like golfers, they tend to rehash each leg of the day's outing in agonizing detail. They also tell the same jokes. (Sample punchline: "The good news is that there's great orienteering in heaven. The bad news is that your start time is 10 A.M. today.") A redeeming feature for orienteers is that by and large, unlike golfers, they have the good taste not to wear white tasseled shoes and chartreuse slacks.

Quintet of kids brave the String-O course together. Exercise introduces children to basics of map reading.

Golfers, on the other hand, get the credibility. "In American culture, if something's on TV, it's important," says Gagarin. "Orienteering is not a TV thing. You don't see the crucial moment when somebody passes somebody else and wins the game. You see one guy cross the finish line and an hour later another guy crosses the finish, and an hour after that, somebody announces that the second guy won by three minutes."

The truth is that most orienteers do not themselves buy into the golf analogy. What they believe in their hearts is that there is an element of excitement, unfathomable on the PGA tour, in what they do. "There has always been a romantic fascination," Kjellstrom has written, "to persons who could find their way through the wilderness and over hidden trails—the Indian, the pioneer scout, the guide, the tracker, the explorer."

A James Bond with "Turbo" compass

One orienteer has included a James Bondian spy tale about the sport in a collection of stories called *Murder At The 14th Control.* A section of dialogue between a kidnap victim and his captor begins:

"You are John Reginald Elliot, special branch marine, are you not?"

"Yes."

"And do you know something about these?" He tossed a red/white orienteering banner towards Elliot. . . . It struck him in the face.

"Yes, but what . . . ?"

". . . People tell me that you are the best in the whole of Britain at finding these things in the forest."

"Perhaps."

Elliot ends up being forced to orienteer with "a pack of wild, starving, half-crazed tracking dogs" on his trail and is obliged to turn his "superb new Silva 'Turbo' model" compass into a razor-sharp instrument of self-defense.

But even within the more modest confines of real life, orienteers treasure what Larry Berman, the ex-

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Contestants display nicks and scratches incurred in heat of battle. Next time, would pants be a good idea?

rocket engineer, calls the "cathartic effect of facing danger." In orienteering, the danger is seldom physical. "The danger is that you will make a mistake," says Berman, letting your concentration lapse and missing a crucial fork in the trail, or veering off down the second ridge instead of the third. At the elite level, wasting ten seconds at every control can mean losing the race. A major mistake—running off the map is surprisingly common—can cost ten minutes or more, and you cannot simply shrug it off and move on; first, you have to find your way back.

What makes orienteering the thinking sport is the need to balance mind and body, to run as hard as you can while still thinking straight, and to make smart route choices (or avoid dumb ones) while the overloaded body is short-circuiting the brain. One orienteer characterized the sensation of running through the woods as a "bombardment of the senses," adding, "you get real stupid out there." Another told me, "I do what I call creative landscaping. You look at the map and you look at the terrain, and somehow your mind tells you they match even when they don't."

In orienteering, as often as not, a judicious navigator can beat a great runner, and this is the secret of its delicious appeal for former second-string athletes. It is the revenge of the benchwarmers—a sport where mental concentration and agility typically prevail over raw athletic power. Orienteers like to recount how Roger Bannister, the first man to break the four-minute mile, tried orienteering and spent three hours negotiating a briar patch. The equalizing effect of orienteering can also apply on the humble domestic level. Out on a course one afternoon, I met a white-haired man in black trifocals named Kent Ringo, cursing with the vigor of the deeply disoriented. Afterward, he confessed that his wife, Caroline, a walker, generally finishes ahead of him: "She goes out and smells the flowers and doesn't make many mistakes. I go out and run and get confused."

Out on the Sprint-O, I was jogging in the company of two older men when we split up in search of the 14th control. I wandered off into "thick forest," searching in vain for the feature represented on my control card by a black triangle—was it a boulder or a cliff? And where was the woman with the hieroglyphics when I needed her? The forest settled to dusk; evening birds were singing, and fireflies blinked on and off all around me. It occurred to me that I was uneuphemistically lost. There was no cracking of branches nearby to suggest that my comrades were also still searching. I imagined darkly that they'd probably found the control and scuttled off like rats, in a misplaced spirit of competition, leaving me to my limited devices. I recollected that in the orienteering murder mystery, it was an attack on an orienteer's mental powers that provoked the fatal blow: "Started hours before me and only just reached number 5? Still with your brain it's only to be expected, I suppose."

Full of grim determination to preserve my intellectual respectability, and also get home for dinner, I doubled back through the woods, searching lower down this time. Then—frabjous dusk!—I spotted the marker flag hanging like an unlit Japanese lantern next to a boulder. I punched my card and veered away with an ostentatious show of still being lost, just in case my comrades were still out there.

From there, it was an easy run to the finish line, where it turned out that I had been beaten not just by my two comrades but by 35 other people. The winner had crossed the line a full 50 minutes ahead of me. Still, I had done it. If I did not quite fit the orienteering slogan, "Give me a map and I'm magic," at least I had muddled through. I went back to my hotel full of renewed self-confidence—moderately bolstered with a couple of banana daiquiris—and there I fell asleep contemplating route choices, reassured that, wherever I was going, I could get there from here.

North American champ Mark Adams looks downright refreshed after winning a Sprint-O meet in Florida.

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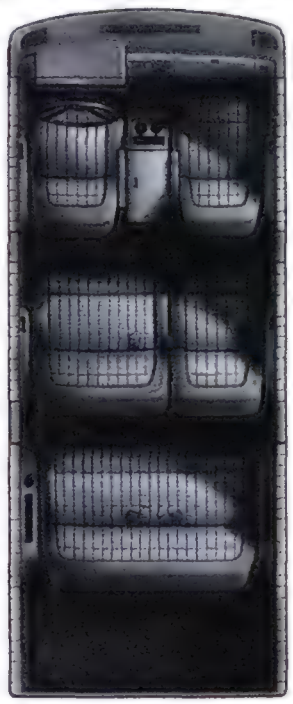

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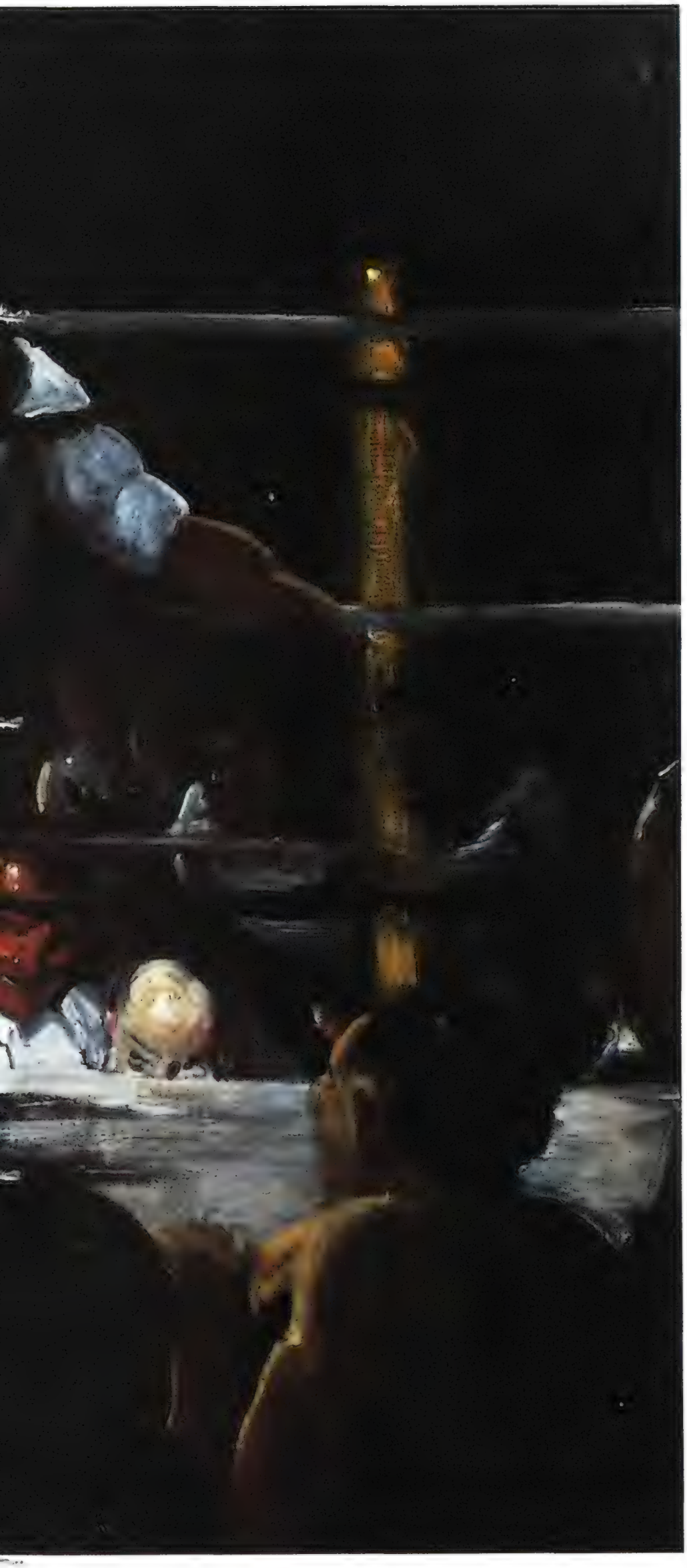


By Bennett Schiff

The boy who chose the brush over baseball

But in an artful compromise, George Bellows gave us some all-time greats of sports painting; his works are now on view in New York City

There is no end to explanations as to why people become what they are and do what they do, particularly in the case of artists. Think of George Wesley Bellows. George. His wife's name was Emma. Their daughters were Anne and Jean. Father, George too. Mother, Anna. He was from Columbus, Ohio, and when he liked something he said "bully" and meant it.

All of this is prescriptive for the great all-American square—in archetypal proportion: a straight-up-and-down, middle-of-the-road average sort. There was that side to George, and while a good deal of it—you could call it plain decency—remained with him always, there grew alongside it a complex and creative artist. And there was one distinctly aberrant thing about him: he turned down an offer to play professional ball for the Cincinnati Reds and chose instead to become a painter. That is hardly, to put it charitably, a normal way for an American to act.

When Bellows opted for art rather than pro ball, the country may have lost a great shortstop, but it gained a fine artist. Since there are more great ballplayers than there are great artists, you could say that, on balance, we came out ahead.

A trained, studious, methodological painter, he was also a determinedly self-taught athlete. Proficient at

Stag at Sharkey's (1909): Bellows freeze-framed the boxers' intensity in a solid geometrical structure.

Mr. and Mrs. Richard D. Zanuck

Fond portrayal of his fellow student Clifton Webb (1905) reflects the influence of teacher Robert Henri.

both disciplines, he brought to each the indispensable ingredients for success—intelligence, creative intuition and just plain stubbornness.

Bellows typified many of the homely virtues through his comparatively short life—he died in 1925 at the early age of 42. But at the same time he was an artist of great substance, as an exhibition now in New York at the Whitney Museum of American Art shows us in superb detail. A joint venture of the Los Angeles County Museum of Art (LACMA), where it opened last February, and the Amon Carter Museum in Fort Worth, Texas, this is the most complete retrospective of Bellows' work yet mounted. It was supported by the IBM Corporation, the Henry Luce Foundation and the National Endowment for the Arts. The impeccably researched and handsomely illustrated catalog is the work of the exhibition's curators, Michael Quick of LACMA and Jane Myers of the Amon Carter Museum, and art historians Marianne Doezema and Franklin Kelly. The show will remain on view until August 30, then travel to Ohio's Columbus Museum of Art (October 11 through January 3, 1993) and the Amon Carter Museum (February 20 through May 9).

Growing up in a solid house of brick

It takes an exhibition of this comprehensiveness to help us understand why there is something so often nostalgic and wistful about his paintings. Is it because he was so boyish, a part of an innocent country lost forever in the years of World War I? The exhibition reveals Bellows as one of the very best American artists; but this is not how he has been recognized in recent years, as American art left behind the realism he explored so tenaciously and plunged on into modernism.

"I arose surrounded by Methodists and Republicans," Charles H. Morgan quotes Bellows as saying in his indispensable biography. Picture Bellows as a boy, getting started in Columbus in that sound and conservative setting, at 265 East Rich Street, a solid house of brick built by his contractor-architect father. He had been given the middle name Wesley because of his mother's conviction that he would become a Methodist bishop, an ambition that, with time, she regretfully gave up. His family was descended from a line of whaling captains who sailed out of Sag Harbor, Long Island, and the Bellowses of Columbus went back there for summer vacations.

Young George is 3 or 4 on this Sunday afternoon, at home after long hours singing and praying at the First Methodist Church. Father George is napping. Mother Anna, a sturdily built woman of ample proportions, is comfortable in a rocker; she reads aloud from the Bible or Longfellow or Scott to the blue-eyed, big-eared little boy dressed in white, who is drawing. One

Albright-Knox Art Gallery, Buffalo

Bellows explored theme of successive generations in *Elinor, Jean, and Anna* (1920), depicting his aunt, younger daughter and mother in a complex grouping; family portraits make up a large body of his works.

thing about artists, great, merely good and even indifferent, is that they begin to draw very early and they never stop, although some of them, as it so often sadly turns out, should have. This is not the case with George.

The boy does not have much in the way of contemporary companionship in this house. Closest in age to him is his half-sister Laura, who is 18 years his senior. His mother was 44 when he was born in 1882, and his father was nine years older. "I could have had him right there in the rocking chair if the doctor hadn't been so fussy," Anna Smith Bellows said after the birth.

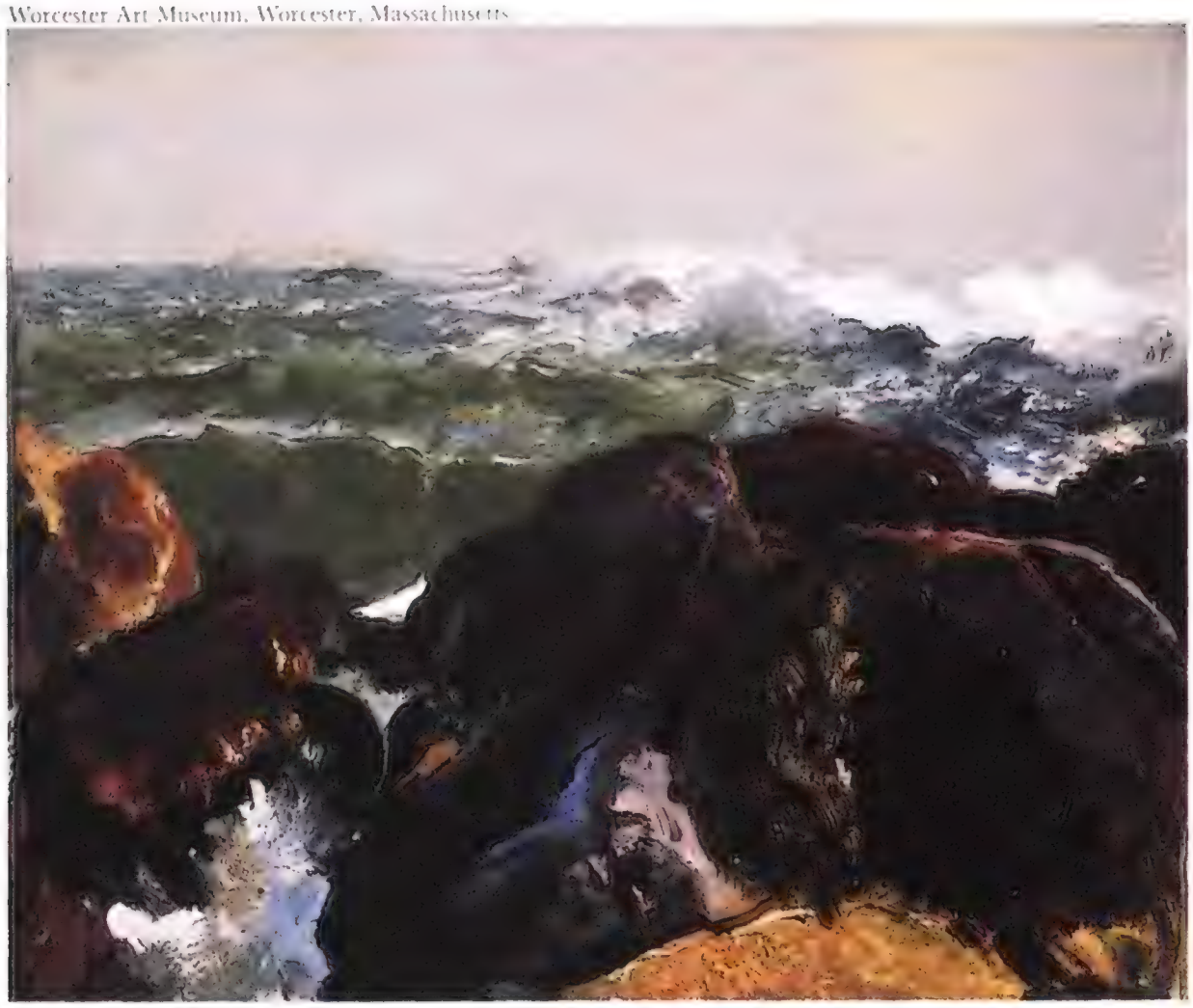
George adored his mother, who once asked, "How many boys on a baseball nine?" He called her "Fair Anna" and would tease her, once saying the laundry had returned her bathrobe explaining, "We don't do up tents." His portrait tribute to her in old age, done in 1921, is one of the notable works of art on the theme, with its distinguished, unsentimental presentation of deep, loving emotion.

The atmosphere in George's home was warm and sheltering, but life outside could be difficult. His mother kept him in white knickerbocker suits until he was 8, which didn't go down well with his classmates in public school. "I was faced by a continual need of self-defence," he later wrote, "and in those days either the street was too dangerous or my face and fists were wounded with the penalties of adventure. It was very good for my muscles."

Young George was, however, an immediate hit with his teachers, who asked him to decorate the black-

Contributing Editor Bennett Schiff recently wrote in SMITHSONIAN *about artists Georges Seurat (October 1991) and Stuart Davis (December 1991).*

Worcester Art Museum, Worcester, Massachusetts



The bold, bright colors of *Monhegan Island* (1913) typify Bellows' paintings following the Armory Show. The sea challenged him; his seascapes, dating from 1910, forced him to study those of Henri and Homer.

boards at Thanksgiving and Christmas. At 10 he was lonely and confused. But that summer of 1892, baseball called his name, and he decided to become an athlete. It changed his life. A lanky, badly coordinated, long-nosed boy with a high, bony forehead, George grew to be a balding, graceful man 6 feet 2 inches in height with a pendulous but still graceful nose. He worked hard at baseball for five years, finally finding a place on the local team. He also joined the YMCA to play the newly invented game of basketball. George became good enough at both to play semipro ball for years afterward.

By the time Bellows entered Central High in 1897 he had become a popular, outgoing young man with a fine baritone voice, which he wasn't bashful about using. During his senior year a baseball scout from the Indianapolis team of the Western League made him an offer, which he declined. Instead, he entered Ohio State University. At the end of his freshman year, the school baseball coach, who also managed a semipro team, put him in as shortstop on that team. Bellows was golden: he had also become the basketball phenomenon of Ohio State, and soon the baseball scouts for the Reds were after him as well.

But as much as he loved the game and the basketball court, he wanted to become a full-time artist. This caused trouble at home, as it often does. Father George, correct and responsible, conservative and reserved, couldn't understand the wild ambition. It was all right to sketch and draw, but why not be a builder like himself? After all, the way was prepared and it was a good life. Hadn't he built the very house they lived in so comfortably; hadn't he, for God's sake, built the First Methodist Church itself! What could be better than that? Art could be better, argued George. Finally, in 1904, with a small allowance from a reluctant father and his savings from playing semipro ball and doing magazine illustrations, Bellows set off for New York, where he rented a room at the YMCA.

"Arrived in New York I found myself in my first art school under Robert Henri having never heard of him before. . . . My life begins at this point," he wrote. If it became a very full life it would also be a short one. Only 21 years later it would be over. But Bellows quickly became a successful and lasting painter who left behind more than 600 paintings, many drawings and a substantial number of lithographs, the art of which he also mastered.

Bellows met Henri before the older artist had set up his own famous school. He was then an instructor at the New York School of Art at 57th Street and Sixth Avenue, presided over by William Merritt Chase. Bellows showed him his drawings, many of them inspired by Charles Dana Gibson's saucy, self-assured young women. "Haven't I seen these before?" Henri asked. But he was impressed and took Bellows under his capacious and influential wing.

Henri (SMITHSONIAN, May 1984) was a charismatic figure, tall, slender, handsome, dramatic, a sophisticate whose heart burned with a love of painting. The father of the Ashcan School, he is notorious for having discovered the streets in which one walked every day as

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places worthy of being documented in paint. Under his influence, American painters took on entirely new subject matter.

Trained in Paris, Henri looked up to Hals, Rembrandt, Goya and, among recent painters, Manet and Renoir. "Anything that strikes you as real is worthy of being painted," he lectured his students. "An artist who doesn't use his imagination is a mechanic. . . . Don't belong to any school. . . . Art has relations to science, religions and philosophies. . . . A drawing is not a copy but an invention."

And so the world turned over for Bellows. Through Henri he met George Luks, John Sloan, Everett Shinn and William Glackens. Among his fellow students were Edward Hopper, born the same year as he; Rockwell Kent; Glenn O. Coleman; and Edward Keefe, who played YMCA ball on weekends with him. Keefe and Bellows formed a baseball team to play students from the Art Students League and the School of the National Academy of Design, the other two major art schools in the city at the time.

Henri was Bellows' mentor as well as an admirer, and the two men became lifelong friends. Bellows' early work clearly shows Henri's influence, as in his 1905 portrait of fellow student Clifton Webb. And as Jane Myers makes clear in her catalog essay, it was not only Henri's technique that influenced Bellows, but also the insistence on getting to the heart of the subject; the "artist's unique perception of some inherent quality of the sitter."

Bellows played big brother to Webb, a callow teenager who later metamorphosed into the suave, self-assured actor. He kept Bellows' portrait, later given to him by a Hollywood studio, until he died. Webb's first appearance in the men's life class had been a nightmare for the youngster; when a speech was demanded of Webb by the boisterous class, Bellows called out: "Don't worry kid. Come and sit by me. I'll look out for you."

Far in quality from Bellows' later masterful works, *Robin, Portrait of Clifton Webb* is still an affectionate and winsome portrait (p. 60). The artist christened his friend Robin Red Nose because of his "expectant, early morning, worm-hunting look" and gave him a nose to match the description.

Bellows decided it was time to say farewell to the YMCA, although he continued to play weekend ball for it at every opportunity. For $15 a week he and Keefe found a room on West 58th Street, which soon became the locus of a burgeoning bohemian life. A year later they moved to a more spacious studio-apartment in the Lincoln Arcade Building at 1947 Broadway.

By that time the 23-year-old Bellows had shed every vestige of shyness. Ethel Clarke, childhood friend of Bellows' future bride, Emma Story, described him this way: "Rumpled as to clothes, paint specks on coat, necktie askew, fingernails far from clean, and one cheek half-shaven, due to nicks and scratches from a dull razor. Violent and argumentative about almost everything. Lacking in all small courtesies. Different

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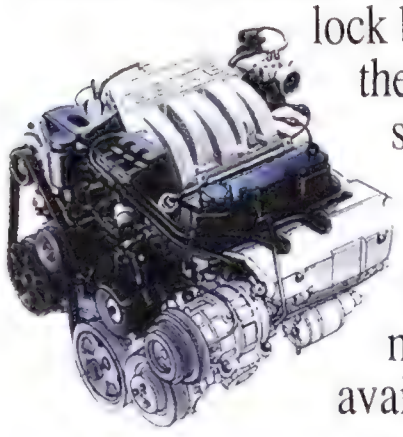

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Corcoran Gallery of Art, Washington, D.C.

Typical of Bellows' genre works, *Forty-Two Kids* (1907) captures physical activity—in this case, swimming.

from anyone I'd ever met. He irritated and shocked me." But when he sang "On the Road to Mandalay" and "Jeanie with the Light Brown Hair" she had to admit he had a beautiful voice.

The studio on Broadway was large enough to accommodate any friends or acquaintances who might need a bed for a night or two. One of them was Moses King, lightweight boxing champ of Connecticut, who was angling for club dates wherever he could find them. Although prizefighting was illegal in New York, private clubs could arrange matches. As luck would have it, one such club, run by Tom Sharkey, was just across the street from the studio. Bellows, fascinated by the energy, color and ferocity of the scene, and eaten by the need to impose a geometric order on what he painted, began his boxing paintings in 1907. Now icons of American art, these are the pictures by which most people identify him. Superb as they are, they have overshadowed his equally impressive seascapes, landscapes, and genre and portrait paintings. A many-sided artist, Bellows brought to each side a distinguished sense of order, design and color.

"I don't know anything about boxing," he once said; "I am just painting two men trying to kill each other." And in *Stag at Sharkey's* (pp. 58-59) and similar paintings, he reached the high pitch of sweat and smell, of blood and rage and the intensity of the arena. From about 1907 he had begun to build his paintings with the care his father put into the construction of a building. Despite his bravura brushwork, there is nothing slapdash about his compositions. Bellows' polo game paintings (p. 64)—there are two beauties in the show—bring to mind the immaculate triangulation of space in Degas' racetrack paintings.

Another drop-in boarder at the Broadway studio was the young, irascible, hard-drinking playwright-in-the-making Eugene O'Neill, already, by his own description, a "Broadway wise guy." Years later Bellows and his wife attended a production of *Desire Under the Elms*. "The play is magnificent," he wrote to theater critic Kenneth Macgowan. "I felt I was under the spell of one of the world's greatest dramatists. I wish I could paint the portrait of Gene O'Neill sometime. As I told you, we were kids together when I was a young art student in New York but I haven't seen him to talk to for sixteen years, I suppose. The talk was very high, or very low, in those days."

In 1910, Bellows married Emma Story, and the couple moved into a house at 146 East 19th Street in the Gramercy Park section of Manhattan. Bellows' father had patiently taught him carpentry, bricklaying, cabinetmaking and drafting when he was a boy, and the artist delighted in building things soundly. He raised the house's roof by eight feet himself, hardly a job for an amateur, and built the cabinetry and storage racks for his studio, in which he worked until his death.

Bellows' career can roughly be defined chronologically by his subject matter—his early work in the city, followed by seascapes, figures in landscapes, genre scenes, and the magisterial and penetrating portraits. The 70 oil paintings in this exhibition represent all these aspects of his career and achievement.

The major works in the show stand out immediately, with the authority and presence of something out of the ordinary. At the Los Angeles County Museum of Art, where the retrospective debuted last February, three monumental works confronted the visitor upon entering. Two of them were stunning boxing paintings, *Stag at Sharkey's* (1909) and *Dempsey and Firpo* (1924). While they are his best-known works, often seen in reproduction, the effect of the originals is still as swift and stunning as a punch on the jaw.

Bringing the chaos under control

But it is the construction, the architecture, of each of Bellows' fight paintings that really accounts for their impact; without that, the subject matter, no matter how striking, would have faded by now into mere illustration. Although the canvases present tumultuous scenes, it is not chaos that causes the effect but Bellows' design of diagonals leading toward a specific point. In both paintings he achieves a static dynamism, a glacial freeze of caught energy. The other painting in that commanding trio was Bellows' triumphant triple portrait, *Elinor, Jean, and Anna*, aunt, daughter, mother (p. 61). In another vein entirely from the fight pictures, it contains its own kind of impact, perhaps an even deeper one.

Bellows revered the work of Thomas Eakins and Winslow Homer as well as that of certain European Old Masters. He was also enthusiastic about the paintings of his contemporaries in the Henri circle. In a letter to Prof. Joe Taylor, who had taught him literature

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At a time when urban renewal was a controversial issue, *Cliff Dwellers* (1913), depicting the congested street life of New York's Lower East Side, startled critics and public alike when it was first exhibited.

at Ohio State and became a close friend, he poured out his feelings about the art scene as he saw it in 1910:

"Then there is some strange disease in people's minds which makes them imagine themselves arbiters of beauty and creates a constant demand that pictures be 'beautiful.' As if Shakespeare had always gone around writing sonnets. The work of art which is a criticism of morality, which presents the cruelty of life, is a horror to these smug individuals. . . ." Bellows' *Cliff Dwellers* (above), a straightforward depiction of street life in a Lower East Side slum, with its bustling crowd and unsupervised children, jarred critics and public alike when it was first exhibited in 1913. "George Bellows' 'Cliff Dwellers' is appalling," wrote New York *Sun* critic Henry McBride. "Can New York really be like that in summer?"

Other, earlier paintings reflected this same direct approach. *Forty-Two Kids* (p. 66) is wild in its exuberance, the brush quick, the subject adventurous for the time. Another blockbuster, *River Rats*, is wildly painted in the background but precisely detailed and highlighted in the foreground, which is made up of tiny, bright slum kids, like a school of glistening fish, out for a swim in the river.

As Bellows gradually introduced more color, his works took on the assurance and power of a mature painter. The effect is immediately apparent in such paintings as *Rain on the River* (1908), a moody land-

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Bellows, who passed up career in pro baseball, threw himself into art and life with unflagging enthusiasm.

scape alive in every square inch. But it is in his *Excavation at Night*, from the same year, that a new sense of drama is seen. The deep hole is alive, and some element of hell is in it, a kind of charnel pit. A companion piece, *Pennsylvania Station Excavation*, is equally forceful. Bellows conveyed the workings of the city with a dynamism unseen in American urban painting until then. His *New York* (1911) is a masterful depiction of what modern cities look and feel like—the compaction of energy, of buildings thrusting down into the earth and up into the skies, of welter, of engagement, of a busy and dizzying place.

The same year he painted *New York*, Bellows got a face-to-face look at the rocky coast of Maine when Henri invited him to join him on a painting trip to Monhegan Island. Bellows was fascinated and intimidated by the coldness and elemental force of the ocean. For those who have not seen his sea pictures, this exhibition will be a revelation. He reported on his progress to Emma, who had stayed with her parents in New Jersey during her first pregnancy: "12 pictures, 30 [panels] now in 3 weeks. Not mentioning what I scraped out." And, "Well Dear Sweetheart, I painted a real sure enough masterpiece today which walks up to The Shore House [a seascape he had started the summer before, during the couple's honeymoon at Montauk, Long Island] and says Hello Kid. I'm with you. It's 'An Island in the Sea.'" Looking at this strange, brooding mass of rock reaching both edges of the canvas, set in a green haze, one is inclined to agree with him.

Back in New York, Bellows worked on seascapes along with paintings of the local scene. He helped organize the Armory Show, which introduced the European modernists to America as well as exhibiting works of contemporary American painters, including several of his own. The Armory Show strongly influenced Bellows; although he remained a realist, he intensified his investigations of color and structure. His later seascapes, for example, such as *Monhegan Island* (p. 62), painted in 1913 after the Armory Show, are far more colorful than his earlier ones.

Another surprise for many visitors to the exhibition will be the range and sensitivity of Bellows' many portraits. As Jane Myers points out, they were central to his work and life. He did at least 140 of them, about a fifth of the output of his 20-year career. Some were commissioned, some not; the largest number, about one-third, were of family members.

One could make a case that the portraits done in the last half-dozen years of Bellows' life are his greatest achievement. The portrait of his daughter, *Anne in White* (opposite), painted in 1920 when she was almost 9 years old, can stand next to a Renoir. A pair of portraits, *Mrs. T. in Wine Silk* (1919) and *Mrs. T. in Cream Silk, No. 1*, as well as *Aunt Fanny (Old Lady in Black)*, from 1920, tell us of the beauty that can exist in old age—the knowledge and comprehension. They are beautiful and searing at the same time.

A persistent pain in the abdomen, which Bellows tried to ignore, resulted in a ruptured appendix on January 2, 1925. He died of peritonitis six days later.

While in Maine painting seascapes, Bellows had written to Emma from Monhegan Island: "If you were with me we could tramp the wild places all day and night and be alone together again; and sit by the sea in the night wind; and watch the moon lay a silver carpet over the ocean. We could slip over the velvet covered rocks down at the Sea's brink and watch the waves reach for us, and you could laugh at me for being timid and afraid of those crystal green hands which are so clean and cold. . . . And everything I spoke of to you would be about Love and beauty and love again and the greatness of this nature which is in us. We two and the great sea and the mighty rocks greater than the sea, and we two greater than the rocks and the sea. Four eternities."

He was a poet, too.

Anne in White (1920) bespeaks a father's love; "I am glad we have girls," he once exclaimed to his wife.

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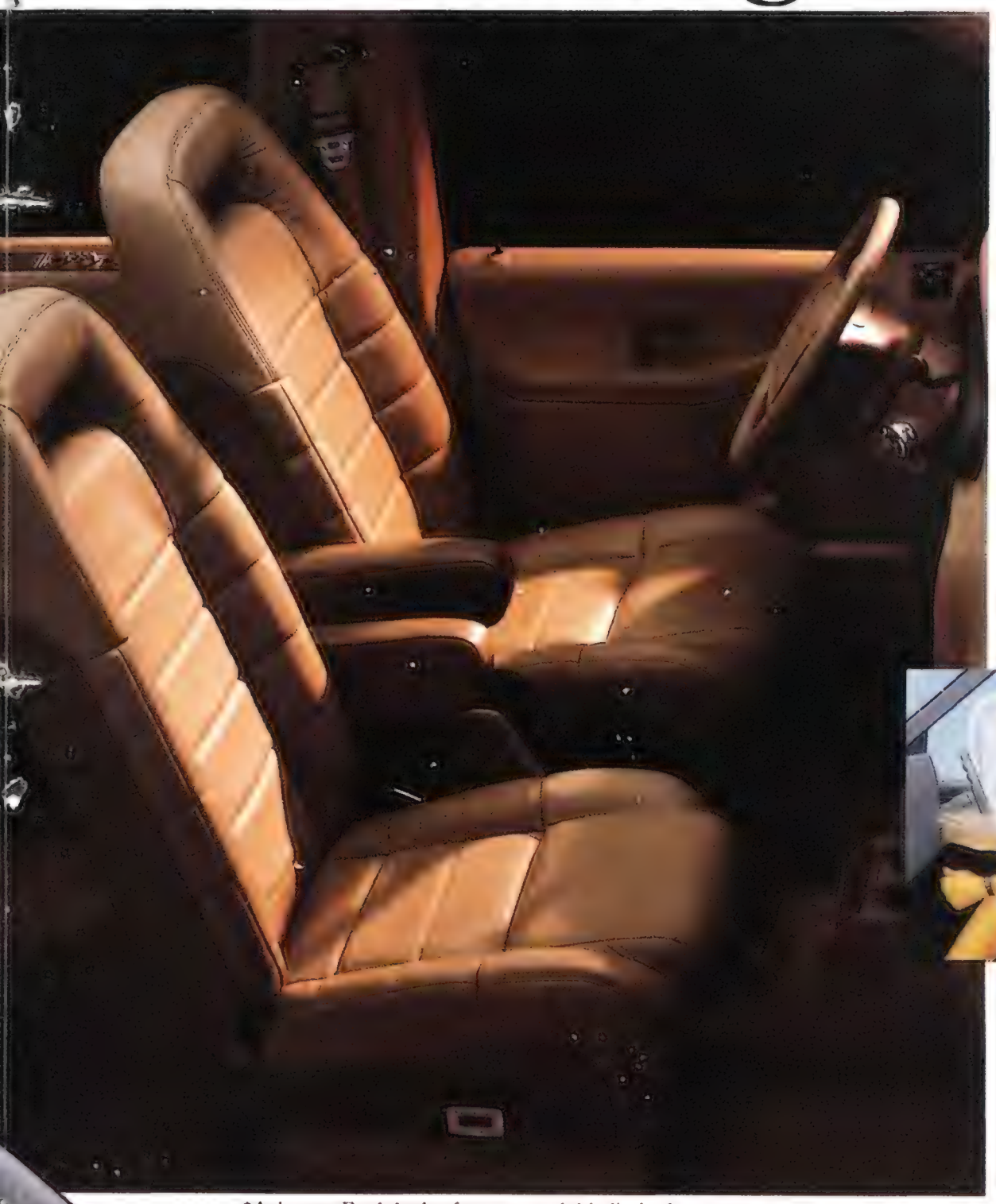

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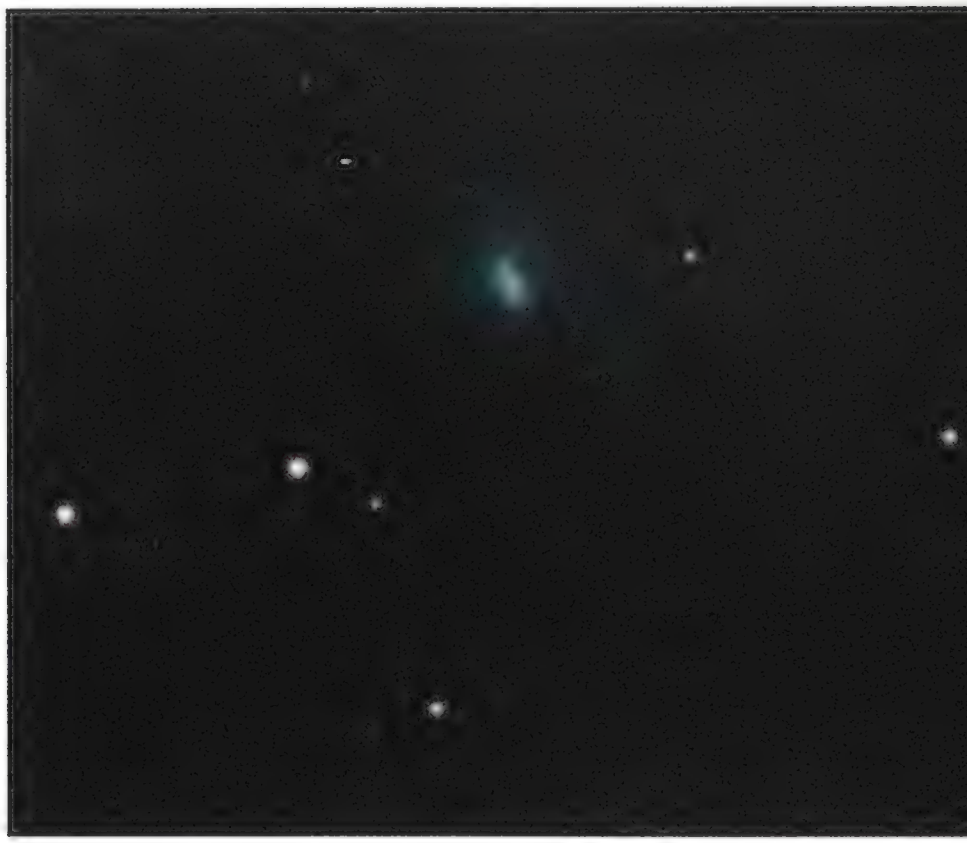
By David H. Levy

A sky watchman discovers comets and immortality

It took the author more than 900 hours to find his first; now his name will be on at least 17 as long as records are kept



The fuzzy object is Periodic Comet Levy 1991q; it appears elongated because it moved during exposure.

The early hours of June 10 were hot and hazy, with crickets, distant lightning, and me, a couch potato, watching a *M*A*S*H* rerun. With dawn less than an hour away, I had awakened to search the morning sky for comets, but the sky was cloudy.

After the episode was finished I stepped outside again. The clouds were beginning to break up, but it was still far too overcast even to think about observing. I took the covers off the telescope and went back inside to watch more *M*A*S*H*. Had the sky been clear, it would have been an ideal time for comet hunting, because the thin crescent of a waning moon meant that the sky was dark enough to search for the faint patches of haze that comets usually look like when seen through a telescope.

Ten minutes later, I checked the sky a final time, for by now the first faint signs of dawn were appearing. Growing patches of clear sky made me decide to begin comet hunting low in the eastern sky. Because it is sunlight that makes comets shine, then the closer a comet is to the sun, the brighter it will be, and also the more easily found. I put my eye to the eyepiece and looked in.

My field of view was about 1 degree across, or two moon diameters, and was full of faint stars. I found nothing fuzzy or unusual in that field, so after a few seconds I moved the telescope eastward and checked the adjacent field of view. After a minute of slow sweeping in this way, a bright fuzzy patch of light entered the field of view, and a "red alert" went off in my brain. But not for long, for by its slightly elongated shape and its position in the constellation Pisces, near the Aries border, I recognized this as the distant galaxy Messier 74 (M74). This galaxy is a highwayman, guilty of waylaying comet hunters in their nightly pursuits. More than 200 years ago it may have duped the French comet hunter Charles Messier, who then added it to his catalog of objects to be ignored as he went on in search of slowly moving cometary prey.

I've encountered M74 so many times that I know it as an old friend. But the sky was brightening, so there was no dawdling over it this morning. I moved the telescope down a field, and another and another, slowly moving toward the horizon. When I got low enough to see distant treetops I turned the telescope southward and then started sweeping back upward toward the west along an adjacent track. Another minute passed, and then the mental alert went off once more: another fuzzy spot had appeared.

For an instant I thought it was M74 again, since the galaxy was close by. But wait a minute: this object was quite a bit brighter. And where M74 had relatively distinct edges all around, this thing had a bright center, then faded off so slowly that I could hardly tell where it ended and the sky began.

With mounting tension I put in a higher-power eye-

Comet hunter David Levy holds 6-inch telescope; in lighted toolsheds behind him are his larger scopes.

Charles Messier (left) compiled catalog of objects that might be mistaken for comets. Jean Louis Pons is credited with 26 comets but found more. Caroline Herschel, the first woman comet hunter, discovered 8.

piece and looked more closely. I know the star fields of Aries, and I know what a comet looks like, and this, Mr. Sleepy Couch Potato, was a comet!

It was my seventh discovery of a comet from my backyard, 30 miles southeast of Tucson, and I should have been a picture of serenity as I sketched the comet's position, opened an atlas of the sky and plotted the comet's position on it, and estimated its brightness. But it didn't happen quite that way. Comet hunting is normally one of the most relaxing of pastimes, but finding one changes everything, and on this morning I paced around the telescope without the slightest idea of what to do next.

Other comet finders tell me that they also get flustered in the excitement of the moment, but I had to pull myself together. The sky was now quite bright. Also, there were a dozen or so active comet hunters throughout the world who were searching for what I had just found. Come on, David, I told myself, get with it.

With shaking hands I marked the comet's position, not far from M74 on the star atlas. Then, putting the telescope on two stars whose brightness I knew and changing the telescope's focus so that they appeared as fuzzy as the comet, I estimated the comet's brightness to be eighth magnitude. Although that is about six times fainter than the faintest star visible to the naked eye, through my 16-inch-diameter telescope it was quite distinct. A closer look, and I noted a short tail pointing away from the sun.

Finally, with the sky now so bright that the comet was almost invisible, I plotted its position again. It had moved about a minute of arc—roughly one-thirtieth the diameter of the full moon—in the 20 minutes since I had first seen it.

Armed with all this information about an object whose existence might still be a secret to the world, I went inside to compose a report to Brian Marsden and Daniel Green of the International Astronomical Union's Central Telegram Bureau, headquartered at the Smithsonian's Astrophysical Observatory in Cambridge, Massachusetts. All astronomical discoveries, from tiny asteroids passing close to Earth to the cataclysmic explosions of supernovas in galaxies a billion light-years away, are announced through Marsden's office. A few hours after I sent my report, a postcard-size circular announced to the world the discovery of Comet Levy 1991q (comets are named for their discoverers and this was the 17th comet to be discovered or recovered in 1991).

But what was the orbit? Was the comet heading in or had it already rounded the sun? Was it visiting the inner part of the Solar System for the first time, or was it a newly discovered periodic comet that returns every few years? Astronomers use photographs, made on film or electronically, to measure precisely where a comet is as it crawls across the sky. Within a few days, another circular appeared with a preliminary orbit for my comet, but it was a full month before enough accurate positions, from telescopes all over the world, told a better story. Looping around the sun in just a bit over 50 years, Comet 1991q is now called Periodic Comet Levy, a newly recognized permanent member of the sun's inner circle. What's more, the orbit is similar to that of a bright comet that appeared almost 500 years ago. Whether the new comet is actually a return of the

Between discoveries, David Levy wrote biographies of the astronomers Clyde Tombaugh (University of Arizona Press, 1991) and Bart J. Bok (in press).

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Ohio comet hunter Leslie Peltier (above) adjusts his 12-inch Clark refractor, which was made in 1868. Astronomer E. E. Barnard, at the controls of a 36-inch refractor, built a house with comet-discovery prizes.

comet of 1499 will be impossible to say until it makes at least two more appearances. So many forces act on comets (the gravitational pull of Jupiter, for example) that comparing their orbits is not simple.

Composed of dust and ice, comets are considered clues to the formation of the Solar System and thus opportunities to learn about our origins. As some come curving in around the sun in six- or seven-year, highly elliptical orbits, and others sweep in just once and then back away tailfirst, astronomers observe them closely, trying to learn all they can. Comets do not often make the evening newscasts as Comet Halley did, but they are not rare. In a typical year, according to Marsden, 30 to 50 are visible in large telescopes, while 3 or 4, even 6, can be seen by viewers with access to binoculars or modest telescopes. Several months can go by without any being visible in small telescopes, however. As many as 30 comets may be discovered or recovered (picked up as they once again approach the sun) in a year. Because each is given a letter, and in 1987, 1989 and again last year, Marsden and Green used up the alphabet, they went through it again adding subscript numbers.

Comets cannot be studied if they have not been found. Yet time on large telescopes at major observatories is much too precious to be spent comet hunting. And so it is left to amateurs to sweep the skies, one of the few endeavors left in which nonprofessionals can make significant contributions to science. Whenever the sky is clear, a band of night-watchmen-of-the-sky spreads out in backyards and roadsides all over the world, and scans the appropriate regions of the sky in an intense competition.

But comet hunting is by far the slowest of all sports. Once I had learned the sky, I searched for 917 hours before I found my first comet, in 1984. If I had spent all those hours watching television, science would hardly be the poorer, because Michael Rudenko, hunting with a small telescope in Amherst, Massachusetts, found the same comet one day later. The hunt definitely has more value if the resulting comet is a faint one that might have otherwise gone stealthily round the sun without having been caught by anyone. For such a discovery I had to search for two more years until I found a faint patch of haze wandering through the constellation Ophiuchus.

During all these hours at the eyepiece, it is inevitable that I would learn what is where in the sky. I travel over and over again through familiar star fields, and quite often I will find a fuzzy object that I will know from its location, for example, in the center of a V-shaped configuration of stars. In the constellation Virgo the galaxies are so thickly distributed that they form figures all by themselves. In a single field of view, for instance, a group of five bright galaxies forms a Y-shaped pattern.

A thorough knowledge of the sky is not enough. The

key to a quick diagnosis is a feel for what a comet really looks like. To achieve that, I try to examine every comet that comes along, and so far I have studied more than a hundred. Some have obvious tails, others creep across the sky as barely detectable patches of hazy light.

Ultimately, recognizing comets is a matter of experience at the eyepiece. Many times I have found what I thought was a comet, only to check an atlas and find a galaxy or star cluster there. So far as I know, however, I have not yet dismissed a real comet by assuming it was a galaxy and belonged there. Other comet hunters have made the same claim. After years of looking, we develop a feel for comets.

Like any sport, comet hunting demands time—time chosen by the hunter and by the sky itself. The moon is the referee, brightening the sky and limiting the search period. The game is especially competitive just after full moon, when suddenly, for one or two hours an evening, a sky that has been too bright for hunting is suddenly thrust into darkness, and comet hunters all over the world rummage through the sky in a scramble for new quarry. Two weeks later the morning sky opens for another inning, and sleepy searchers peer through their telescopes to see if anything has appeared.

Records of comet observations date back to the 15th century B.C. But the man who really started comet hunting as a serious sport was Charles Messier of Paris. He found so many comets that Louis XV called him a ferret of comets, and the president of the Paris Parliament frequently invited him to dine.

Messier mourned his wife—and a comet

There is a famous but possibly apocryphal story about Messier's losing a comet discovery to his rival Jacques Montaigne, because he was mourning the death of his wife. A friend embraced the grief-stricken man to say he was sorry for Messier's loss. Messier glared at his visitor. "Alas," he said, "to be robbed of the 13th by that Montaigne!" Quickly realizing his faux pas, Messier tried to recover. "Ah, the poor woman," he said. No doubt his friend agreed.

In 1986, while visiting the Paris Observatory, I examined one of Messier's observing logs. As I shared his notes, his descriptions of the telescope he used, his complaints about the weather and his comments about what he was looking at, 200 years seemed to slip away. Not that much has changed; his notes could well have been my notes. I appreciated his way of marking his lonely time at the telescope with the hourly toll of the bells from 42 churches.

The revolution in France saddened and frightened Messier during the last years of his search. Forced to leave the observatory in Paris, he continued his work in a quieter location and found his last comet in 1801. Jean Louis Pons, a 40-year-old doorkeeper and janitor at the observatory in Marseilles, beat him to it, however, finding the comet near the Big Dipper a day earlier and receiving full credit for the find. This little comet was the first of 26 that would bear his name. As Pons found comet after comet, he rose through the ranks at the observatory, until he became its assistant director.

By now the competition was intense. In England, Caroline Herschel began using one of her brother William's telescopes to search the sky for comets. She found her first in 1786. By the time she found her eighth, she was known throughout Europe for her "eccentric vocation," which included a log of her discoveries entitled "Bills and Receipts of my Comets."

In 1831 Denmark's Frederick VI added to the romance by awarding a gold medal to the discoverer of a comet. It was the first of several comet-finding medals given in different countries and times. The most lucrative of these prizes was given by H. H. Warner to any North American discoverer of a comet, and helped spur a "golden age" of hunting during the late 19th century. The $200 sum, quite substantial in those days, probably saved the credit rating of the astronomer Edward Emerson Barnard, who used his money for a

Eugene and Carolyn Shoemaker are at viewer on which they've found 26 comets; films are under her hand.

down payment on his Tennessee home. Anxious about future payments, he discovered another $200 comet. "The faithful comet," he wrote, "like the goose that laid the golden egg, conveniently timed its appearance to coincide with the advent of those dreaded notes. And thus it finally came about that the house was built entirely of comets. This fact goes to prove the great error of those scientific men who figure out that a comet is but a flimsy affair after all, infinitely more rare than the breath of the morning air, for here was a strong compact house, albeit a small one, built entirely out of them. True, it took several good-sized comets to do it, but it was done, nevertheless."

By the late 1930s Leslie Peltier, an Ohio farmer's son with an 11th-grade education and ten comet finds, had become famous. He approached comet hunting with reverence. "Time has not lessened the age-old allure of the comets," he wrote in his autobiography, *Starlight Nights.* "In some ways their mystery has only deepened with the years. At each return a comet brings with it the questions which were asked when it was here before, and as it rounds the sun and backs away toward the long, slow night of its aphelion it leaves behind with us those questions, still unanswered.

"To hunt a speck of moving haze may seem a strange pursuit, but even though we fail the search is still rewarding, for in no better way can we come face to face, night after night, with such a wealth of riches as old Croesus never dreamed of."

Although comet hunting has been the province of amateur astronomers, some, like Barnard, became professional astronomers using large observatory cameras to hunt for faint comets far from the sun. Rarely, a single comet might bear the names of professional and amateur observers. In 1968 Mark Whitaker, a 16-year-old amateur astronomer from Texas, began comet hunting as a summer project with his 4-inch-diameter reflector and found a ninth-magnitude comet after only three evenings of searching. Only two nights later, astronomer Norman Thomas discovered the same comet with the Lowell Observatory telescope that had been used to find the planet Pluto in 1930.

Another amateur-professional discovery was the result of a long series of coincidences. In 1988 I found a faint comet in the morning sky. Although it was three days before I was sure it was a comet, the object was finally announced as Comet Levy 1988e. Two months later, geologist Eugene Shoemaker and his wife, Carolyn, who had been observing my comet, took some photographs with the 18-inch Schmidt camera at Palomar Observatory. But it was the end of an exhausting weeklong session, and they mistakenly photographed a field some 20 degrees (or 40 moon diameters) away from where Comet Levy was. As Carolyn Shoemaker checked the photographic films under a special stereomicroscope, she found what she assumed was Comet Levy. With some further checking, Shoemaker realized the error. But if the comet on their film was not Comet Levy, what was it?

The Shoemakers had found a new comet, but there was another surprise to come. When the orbit became known, it turned out that it was once part of Comet Levy after all. It was traveling round the sun in precisely the same path, but following it by more than two months! Some 13,000 years ago, according to Brian Marsden, a comet broke in two as it rounded the sun. The twin comets stayed close together for many years, and then almost imperceptibly they started to drift apart. As they continue to orbit the sun, their next visits will be separated by more than a century.

And the hunt trophy goes to . . .

Using the Palomar telescopic camera, Gene and Carolyn Shoemaker have now found 26 comets as a team, and Carolyn has one other to her credit, which according to Marsden's *Catalogue of Cometary Orbits* makes her the all-time champion. But Marsden cautions that the rules have changed over the centuries. Pons clearly discovered other comets, including one twice, that do not bear his name. On the other hand, he took 25-odd years to find the 26 officially credited to him. Gene Shoemaker began searching for asteroids (SMITHSONIAN, September 1989), which cross the orbits of Earth and other planets, in the early 1970s; only in 1980 did his wife, Carolyn, add comet hunting to the program. They have been averaging three discoveries a year since 1983. Instead of hunting the sky with eyepiece and telescope as amateurs do, they capture comets on film. In 1989 I joined the Shoemaker team, and we meet at Palomar each month in the dark of the moon for a seven-night marathon of searching the sky for asteroids

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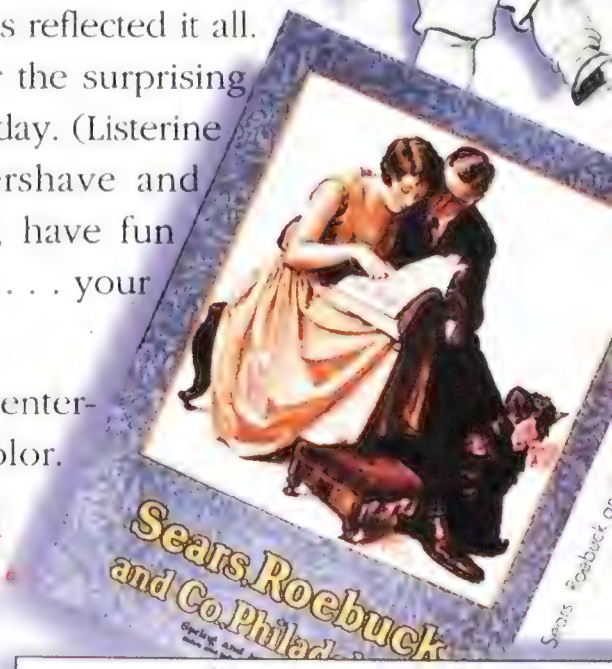

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and comets. The methods are quite different from those of a visual search. With the first film of the night safely loaded into the telescope, I move the telescope to a location that Gene Shoemaker has read to me. I look through the eyepiece, and if I have set the telescope correctly, a bright star is in the field. Then Gene gives a countdown—four, three, two, one, *open*! With a squeaking sound, two metal shutters open at the top end of the telescope.

For the next six minutes I really appreciate the difference between visual comet hunting and its photographic counterpart. If I were using my own little telescope, I would be watching field after field of stars move through the eyepiece, and I might pick up a comet of 11th magnitude or brighter. But now I concentrate on a single solitary star. In this curious exercise called guiding, I must keep the star exactly centered on the crosshairs of the eyepiece. It is a challenge, for even though the telescope is electrically driven to follow the star, it often drifts forward or backward a bit. It is a battle between my control buttons and the telescope. For six minutes I freeze the sky on film and can only imagine the wonders that later might be found there.

Gene is back with a new film he has loaded in the downstairs darkroom. Ending the reverie, I close the shutter, move the telescope to a horizontal position, cover the film, remove the filmholder, grab Gene's new filmholder, load it, point the telescope and find the star—all in two minutes. Gene's countdown starts a new exposure, and I acquaint myself with a new star all over again.

The comets just pop out at us

Using a special stereomicroscope, Carolyn then scans each pair of films. Just as objects in a stereo photograph seem to pop from the background, any object that is in a different position from one photograph to another will stand out clearly. Our team has so far found ten new comets of which eight are periodic.

Now it's late on our seventh night of observing. We have taken more than 400 films, covering almost half the sky. As I guide on yet another star, my lazy mind starts to wander to a childhood memory of a conversation at the family dinner table. At age 12 I had already fallen in love with the sky, and my father was telling me of a novel he had read when he was a youngster. Called *Cole of Spyglass Mountain* (1923), it was about a young man observing Mars from his small homemade observatory. The novel ended one night when Cole found evidence of life on Mars—and instantly became a celebrity. "If you ever find that book," Dad said, "I'd like to read it again."

Five years later I began my long search for comets. As the years went by and Dad grew older, he would often ask if I had found *Cole of Spyglass Mountain*. Then his memory began to fail with the onset of Alzheimer's disease. As his time grew short we spent more of it together, and I watched helplessly as he forgot names, forgot people, and once even forgot that I was his son. But somehow he never forgot that euphoric story about a boy and a mountaintop that had captured his imagination so many years earlier.

When I finally found my first comet in 1984, I felt as though I had rewritten *Cole of Spyglass Mountain* in a private way just for my father. But Dad was too ill to appreciate it, and he died only a few months later. I will always regret that I could not share the most significant moment in my life with the most important person in my life. And while my eye is in the present, concentrating on that distant star shining through the eyepiece, my mind is back at the dinner table, wondering what all of this would have meant to Dad. If the photograph I am guiding bears another new comet, *Cole of Spyglass Mountain* will be written yet again.

Author checks out the Schmidt before another night of observing on Palomar. Opposite: passing star "N" in constellation Scorpius is Comet Levy 1990c.

By Richard Meryman

'Crescendo coming, so don't push it, lead it, keep it free'

With a voice that glistens and a gift for spontaneity, soprano Renée Fleming launches into a splendid operatic career

With a little hands-on help from her teacher, Renée practices the correct tongue position, mouth opening.

At New York's Metropolitan Opera House, 32-year-old Renée Fleming sits in her dressing room while a makeup man paints blush on her rounded cheeks. It is a pretty face, youthful, guileless, fresh. Watching in the mirror as she is transformed into an 18th-century countess, her gaze is direct and innocent. Her talk to the makeup man is studded with words like "cool," "golly" and "holy mackerel." From Churchville, New York, she was prom queen of her high school. Though in an hour she will be singing in the world premiere of *The Ghosts of Versailles*, commissioned to celebrate the 100th anniversary of the Met, she cheerfully bubbles to the man bent over her. "You are the most gentle makeup artist I have ever known," she says. But her eyes are unsmiling.

Summoned to work on a lead baritone "immediately," the man leaves the room, muttering, "The women have the reputation, but it's the men who are the pain in the butt." He is replaced by a woman who fits a bouffant wig over Fleming's brown hair. Through the walls and from the hallway come the muted warblings of sopranos singing scales, like athletes warming up, an obbligato suddenly louder as well-wishers keep opening the door, letting in gusts of notes and an electric draft of excitement.

Through the door too, come men from her management agency, other agents, the big noises of the Met like Joseph Volpe, the general director, and even James Levine, the opera's conductor and Met artistic director. Cast cohorts say "Toi, toi, toi," an opera expression for "Good luck." After each person leaves, Renée, who had expected just a few friends, turns to her husband of three years, Rick Ross, an actor in from Los Angeles, and says, very pleased, "I can't believe this." To her the parade means, "I'm a contender."

Renée Fleming is on the cusp of a great singing career, if, if, if.

"Beautiful voices are ten cents a dozen," Rudolf Bing, the former head of the Met, once said. Of all

The complex physical demands and stresses of grand opera are without parallel in the performing arts.

forms of musical performance, opera is the most complex and demanding. It requires singing while acting, moving, projecting sound to the farthest recesses in a vast, cavernous theater. The career itself is riddled with stresses and pitfalls. There are only a handful of topflight opera singers in the world, and only a few sopranos of the first order.

The opening night of *The Ghosts of Versailles* is the climax of 12 years' work by composer John Corigliano. To produce the elaborate sets, alone, took two years. Most rehearsal schedules are three to five weeks—and the stars, who have already sung the roles often, sometimes arrive just at the end. *Ghosts* needed eight weeks to coordinate 36 soloists, a 53-member chorus, 18 extras, 16 dancers, 17 stage musicians. At the end of Act I, most of the cast is onstage. And the gamble of a new opera is never settled till opening night.

Fleming's role is Rosina, the Countess Almaviva, a

Photographs by Harry Benson

Playing hooky from high art, Renée belts out a jazz number in a West Side night spot. She loves jazz, saying its register is freer than opera, but rarely performs it since smoke is bad for her voice.

famous character in plays by the great French dramatist Beaumarchais and in operas of Rossini and Mozart. In *Ghosts*, the Countess sings in a miniopera staged by Beaumarchais (sung by Hakan Hagegard). It is done for the benefit of the ghosts of Marie Antoinette (Teresa Stratas) and the rest of the court of Louis XVI, who still haunt Versailles. The miniopera is a semicomic sequel to both *The Barber of Seville* and *The Marriage of Figaro*. In a subsequent play, the Countess has had a son from an affair with the page Cherubino, and the action in *Ghosts* is set 20 years later.

During the three hours of *The Ghosts of Versailles*, Fleming will be singing in phantasmagoric settings—ghosts wafting through the air, proscenium arches floating down to the stage, a gigantic pasha singing atop a platform while cradling a man in one arm. Scenes change and meld into one another behind a scrim like a slow, ghostly dance in stationary time.

Even after the great gold curtain of the Met slowly ascends, she has a half-hour before her first singing entrance. She warms up—"Getting my muscles flexible," she says, "getting my breath flowing, the placement correct, the instrument oiled and loosened." Singing the vowels from low to high register, starting with "ba, ba, ba, baaaaa," she walks about the room with a piece of a chopstick clenched between her teeth, a trick learned from her voice teacher to help her tune herself. It gives her muscles the right starting point by setting the jaw at the proper width, forcing her tongue to relax and thereby opening up the full range of notes.

Removing the stick and saying, "Ugh! How weird," she sings, "eee, eee, eee, eeeee," and watches in a mirror to see if her soft palate is stretching and flexible. She massages her jaw muscles, which knot from persistent daily stress that causes her to clench and grind her teeth. At night she has to sleep using a device similar to a football mouth guard.

Now a voice from a loudspeaker summons "Miss Fleming" to the wings for her entrance. There in her blue dress, panniers extending her hips, she stands amid the welter of waiting costumed singers and readied props—including ten huge, turbaned, mustachioed Persian heads on rollers.

She is looking out at the Met stage, which is a pinnacle in her profession. In the house are 4,000 people waiting to decide how good she is. And every opera stage is a potential minefield waiting to break a singer's concentration: a soprano opens her mouth to start an aria, and there is a sudden noise onstage or humming offstage; a partner in a duet can do an unplanned star turn, moving upstage.

At the Spoleto Music Festival in 1990, on the opening night of *The Marriage of Figaro*, Renée remembers, the stage manager forgot to ring the bell calling the audience in for Act II. The curtain went up on schedule. There she was as the Countess Almaviva, standing alone onstage, her first appearance during the opera—and her debut in Italy. She was drawing in breath to sing a tough aria—introspective, controlled, accompanied by quiet music—"very exposed," she says, "because there wasn't loud music to hide tonal im-

perfections." The audience filing in late was a bedlam of yells, oaths and boos. The curtain came down again, and Renée sat there by herself, the temperature sweltering, and listened to the tumult. "It was horrifying," she remembers. "My adrenaline went crazy."

Learning to cope with the unexpected is an important part of the long seasoning of a singer. "Like meditation, you must learn to let everything pass through you and keep concentrated," says Carol Vaness, a top-rank soprano, who once had to sing while watching a man in the front row dying of a heart attack. But usually on opening nights Fleming is depressed rather than nervous, and filled with numb dread. In her mind she hears an interior monologue, "*I might do well and it might be OK, but it's not going to be amazing.*" And then, suddenly the words: "*You've got to be perfect.*"

She makes her entrance. Her initial solo aria begins—and with it a stream-of-consciousness coaching starts in her head. "*Stay free. Send the sound. Watch your pitch on that note. Release your jaw and let your tongue go forward. Release the back of your neck. Feed the air. Place that tone more in your mouth. Crescendo coming, so don't push it, lead it, lead it, keep it free. Now the high note. Keep the balance—not too much pressure. Release the palate. Find the resonance. That note was too bright. Darken it this time.*"

She is well into the aria by now: "I felt wonderful," she recalls. "James Levine looked up and genuinely smiled, which added to my feeling that everything would be fabulous. I felt myself spinning out sound into the hall, and in the same instant it rebounded back to me. I felt it was produced with comfort and joy in my body, which was filled with the vibrations of the sound. It's the high that runners talk about—a buoyancy—an adrenaline high. The endorphins pouring into your body. When I am singing well, I feel I am much larger than my body."

Fleming is a lyric soprano who can sing in six languages and do the vocal acrobatics required in the ravishing and demanding operatic style known as bel canto. Her voice has a limpid, matchless brightness that can bring goose bumps. It is an arresting voice, her own special, personal sound that seizes the attention, like sunshine on a spring shower, each drop sparkling.

Hearing her sing only ten notes, the great mezzo-soprano Marilyn Horne thought, "That's a terrific voice." Talking about Renée on the opening night of *Ghosts*, she says, "It's got those gorgeous qualities that go right to your ear—and that's what makes the ladies stand out from the girls." Carol Vaness adds, "You make a sound that comes out of your body and people take it into themselves, feel it fill them. It is like making love to somebody."

Unlike many opera singers, Fleming has no sense that God touched her vocal cords. Her parents—now divorced—were high school music teachers in Rochester, New York. Her father, Edwin, was a strong, loving man, idolized by Renée, her younger sister, Rachelle, and younger brother, Ted. Renée's mother, Patricia, who gave up a possible singing career for marriage and

Taking a lesson, Renée sings under tutelage of Beverley Johnson, who teaches at Juilliard and has worked with many celebrated opera stars. "Beverley was the architect of my high notes," says Renée.

children, was a charming and dynamic woman of Czechoslovakian ancestry.

Music was the heartbeat of the house. Voice production became dinner-table talk. Edwin and Patricia took the children to every musical happening in the area. During elementary school, Renée had lessons in piano and violin. She found them dull, dull, dull. In the second grade she started ten years of dance lessons. "I hated every step," she says, "because I wasn't terribly good, and kids made fun of me."

But for the three Fleming children there was always singing. As a trio they were pushed into performing in talent shows, high school music productions, choirs, nursing homes, the Eastman School of Music—anywhere Patricia had entree. "When I was practically an infant," Renée remembers, "my mother would teach us songs and dress us up. I never liked it. I never thought I had any special talent. It was something she made me do. I remember wanting to be the first lady President and was interested in psychology for a while. I never had any intention of singing as a career."

Still, she kept singing and sometimes had the lead in school musicals. They made her feel good at something. But she always felt torn between wanting to be accepted by her classmates and wanting approval from adults, especially her parents, who were role models impossible to equal. She got top marks at school. Her schoolmates unkindly nicknamed her "Miss Perfect." But, says Renée, "what I really wanted was to smoke in the bathroom and wear nylons."

Then she found something that was all hers. During four years in the music school at Potsdam College—from which she graduated magna cum laude—she sang jazz with a student band every weekend. A constant party, the gigs forced her to banter with the audience, come out of her shell, become almost extroverted. On campus, singing jazz, she finally achieved her dream of popularity.

In college she also took the first, chancy step in an opera career, one that has derailed many hopeful talents. She started working with a voice teacher. She was lucky. The one she found was Patricia Misslin, who sold her on the challenge of opera, music not of the past 30 years, but the past 300. "If I'd had a weak teacher," Renée says, "I wouldn't be singing opera today."

Moments with husband, actor Rick Ross, are limited by divergent careers—she singing, he in Hollywood.

"My voice went nuts from nerves"

At age 22 she moved on to graduate school at Eastman in Rochester and soon found herself in a personal crisis. It came to a head during a competitive audition run by the Met. Singing in front of her family, she failed miserably. "My voice went nuts from nerves," she remembers. "I cried for 12 weeks. I didn't know why I was singing. I didn't know what I wanted—not even what to eat for lunch."

Helped by therapy, she went to the Juilliard School of music in New York, next door to the Met, and reveled in a new independence. Again, she found a great voice teacher, Beverley Johnson (p. 87), an ageless dynamo who has worked with such stars as Renata Tebaldi, Anna Moffo and Giorgio Tozzi.

There are many types of teachers. Some like to possess, to be the guru who listens to the dependent student's troubles. Some teachers simply stroke their students, saying, "That was lovely, my dear. Lovely."

Beverley Johnson is a trained musician and student of the physical mechanics of voice production. She concentrates on imbuing the right muscles with the right habits. "If a singer slips into bad habits, this crazy

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After the show, we just headed down Broadway and fell into this charming cappuccino place. We were both still full from dinner, but we couldn't resist. Cozy little booths... a jazz ensemble. What a find. Oh, the best part— they had this singer come on. She was great. She had the whole crowd singing. Then, she passed the mic around and we all sang solo. It was hysterical. We stayed till 1:45 in the morning — and walked back. There was this guy selling paintings a few blocks from the hotel... but wouldn't you know, after 5 mos. of searching for something for the kitchen wall, we found it in 2 minutes. You should've seen us. I don't know what was bigger — the painting or the grins on our faces. And all I kept thinking was

thing, our brain, may say, 'Oh, is that the way you sing it?' And her muscles will do it wrong every time."

Like every singer, Fleming is essentially a wind instrument requiring exquisite breath control, called "support." She must meter out air with her diaphragm, using exactly the right pressure to make each note sound effortless. Too much pressure in a high note produces something like a screech. Since the instrument is the entire body, one misplaced, tense muscle—even a clenched fist—can create a different sound, can affect the metering of the breath.

According to Johnson's theory of voice production, printed in the brain is a memory of each note. When Fleming wants a particular note, the brain actually hears the note a nanosecond before it is sung, then sends a message down a long nerve to the vocal cords.

The singer controls the pitch, the quality, the color, the inflection, the beauty of the sound, by the "placement" of the maximum resonance. Low notes are in the chest. The middle register resonates largely in the mouth. High notes ring in the cavities in the head, including the throat, mouth and nose. During a high C, the vibration is so intense in the head, it can make a soprano dizzy. "If we were sensitive enough," Beverley Johnson says, "we would feel the vibration in our bones, which are hollow."

Part of what a soprano learns is the sensation in her body when a note is perfect. In one lesson Johnson saw Fleming's tongue muscle bulging a bit under her chin, an indication of tension. She made her quiet the muscle by pressing it under her chin with her thumb—reminding herself how the note felt when sung properly.

The correct sensation is vitally important because the sound powers out of a singer's mouth in a fan shape and, surprisingly, her ears cannot precisely check the pitch, the overtones, the brightness of the note. Sometimes a singer falls in love with the beauty of her own voice. She stops projecting it, pulls it back into herself where she can hear it better, enjoy it more. If that becomes a habit, says Johnson, "in six months to a year, the career can go *pfft*."

Muscles misused over time become rigid, the voice goes out of pitch, the breathing is bad, singing becomes yelling, one after another the high notes disappear.

The enormous physical demands of singing reshape the body, just as running shapes a marathon runner. Renée's breathing apparatus is still growing, her rib cage becoming huge, her abdominal muscles getting stronger. "My neck is getting big," she says. "In five years I'll look like a no-neck football player."

The ultimate goal of all opera singers is to be able to forget technique, to have their repertoire so ingrained that the music is part of the warp and woof of their being. Then the concentration is on the mysterious power to load words with sadness or joy, color the sounds to stir the soul. Carol Vaness describes this state as "being able to sing a soft A because your character is dying, not because 'here comes a soft A, wait till you hear this.' "

Being made up for *The Ghosts of Versailles*, Renée warbles, chats and reads notes from her admirers.

Beverley Johnson tells about being backstage when the great Wagnerian soprano Birgit Nilsson, in *Tristan and Isolde*, opened an aria with soft passages that nevertheless projected to the rear of the house—and then built and built to a tremendous crescendo. "I mean," Johnson says, "the walls went out and the ceiling went up. She seemed possessed." But she was totally in charge and totally at ease at the same time. Finishing, Nilsson left the stage, greeted Johnson—"How nice to see you"—and as was their custom, a friend at the Met handed her a beer.

After Juilliard, Fleming spent almost two years in Germany—one as a Fulbright scholar—the final break from parental influence. She learned German but fell into the hands of a teacher who only taught "covered" singing, singing from the back of the mouth and throat. When she returned, her voice was smaller and her top notes were gone. So it was back to Juilliard and Beverley Johnson for another year.

In world-class singing, confidence is essential. If you make a mistake, practically the whole world instantly knows. Says Carol Vaness, "You're in a profession where other people are paid to criticize you from the

The author has written many magazine articles and books on such diverse subjects as painter Andrew Wyeth and talk-show tigress Joan Rivers.

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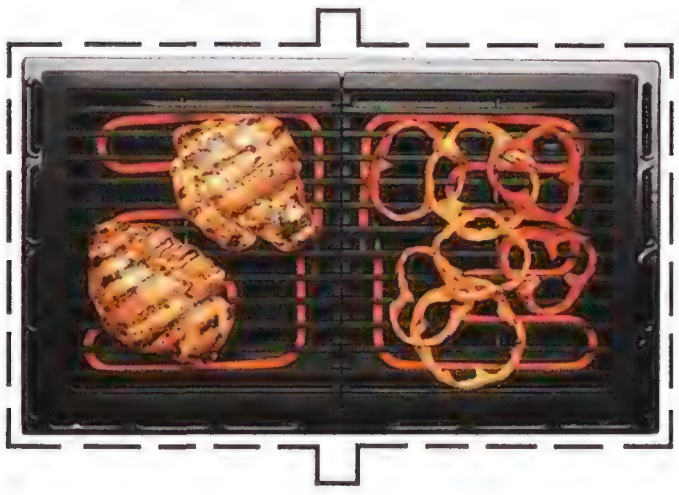

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As Countess Almaviva in *Ghosts*, Renée begs the Count's forgiveness for her affair with Cherubino.

beginning of your career to the end. Some conductor is saying 'Daaarling, Daarling, don't do that, Darling'—and I'm answering, 'Don't do what, Darling?' If I began to believe these people, I'd lose my confidence." Renée recalls Leontyne Price describing confidence as "performing arrogance."

During her second stint at Juilliard, Fleming had another crisis of confidence. She sang in the first round of 14 auditions and competitions, and was never called back, not once. Letters to 50 agents and opera companies brought only "Thanks, but no thanks." She was wrenched by disappointments, and found that she could not sing onstage as well as in practice because of stage fright. Her confidence collapsed. She began to eat compulsively. One day, singing in a master class, she suddenly broke down weeping.

More therapy followed, and special work on self-esteem. She began singing more for herself, and less for the sake of recognition. Then Merle Hubbard, from the well-known Herbert Breslin agency, heard Fleming sing. Hubbard told her that her voice didn't suit her choice of arias; her voice was full of innocence while her body language was, "Love me, love me." He suggested that she feature an earthy aria called the "Song to the Moon," from the Czech opera *Rusalka*.

During childhood, Fleming had heard her great-grandparents using Czech when they argued, to keep her and the other children from understanding. So, in a way, the "Song to the Moon" was part of her being, a sort of homecoming.

She sang it in 1988 auditioning for the Houston Opera's studio—and the director immediately wanted to hire her as a member of the opera company. Her confidence bolstered, her voice subtly freer and more open, she entered the high-pressure audition for the National Council, a contest put on each year by the Met—and got one of ten first prizes. A week later, she took first prize in the national George London competition. Suddenly agents were pounding at her door. She chose Merle Hubbard.

Ten operas in 14 months—"downright stupidity"

In 1988, at the Houston Grand Opera, she sang the Countess Almaviva in *The Marriage of Figaro*, an elegant and melancholy part, a role that has since become her specialty. It was what she sang for her Met debut in 1991. She began singing in major U.S. opera houses and concert halls. She did operas at London's Covent Garden, the Paris Opera and the Teatro Colón in Argentina. Then, in 1990, she won the extremely prestigious Richard Tucker Award, receiving $25,000 and TV exposure.

Fleming was initially booked for ten operas during a 14-month period this year and last—"downright stupidity," she admits. Her ambition is to reach a day when she has the prestige and courage to say, " 'I don't want to accept this contract,' and not be terrified that I'll be hated, that I'm a bad girl." But, she explains, "No" is still a hard word. "I always get excited and say yes. And when Merle calls up with new offers—'La Scala wants . . . ,' 'Covent Garden asked . . . ,' I'm so excited, I can't even say I'm not available."

A heavy schedule like Fleming's means problems and is hard on confidence. Carol Vaness explains: "That means a year of continual stress, traveling constantly. Suppose you're doing *Tosca* at La Scala with Placido Domingo. You have the title role. You have the stress of the hardest music, but you know he's going to get all the attention no matter what you do. So you feel ignored and rejected.

"Not only that, you are simultaneously preparing a future role, the lead in *Norma*, say, and the tenor you're going to be working with is a high-powered person like Luciano Pavarotti. Or maybe they have a second-class tenor who does not support you, or you have a fight with the director, or you feel ugly in your costume. *Norma* is a killer—you sing for 40 hours straight and it's opening night, so there are millions of parties, and everybody is expecting everything out of you."

So far Fleming has skirted another of the most destructive pitfalls in an opera career: moving too quickly into roles demanding a heavy, huge voice—Wagner, Verdi, Richard Strauss, some of Puccini. Sometimes a singer simply does not have the vocal equipment. In

The sheep that came home for winter.

Winds here can scream up to 70 miles per hour. Temperatures plummet to 20 below. This is Stillwater Valley, Montana. The winter home of a small, fledgling herd of Bighorn Sheep. A herd that for years has been struggling to survive. But people who work nearby are providing medication and food to nurture, protect and save these majestic animals. Hopefully helping each generation become healthier. Each generation larger.

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the early 1980s, no less a star than Pavarotti overextended by taking on *Il Trovatore* and *Aida*, and began losing the soaring purity of his voice—regaining it only when he returned to a lighter repertoire.

Thanks to her success and her marriage, for the first time in her life Renée is truly happy. Still, she has dreams in which she is pulled off the street, thrown onstage and doesn't know the words or music.

She is still surprised and pleased when somebody recognizes her in a store, but within the opera world she gets star treatment. Her income has doubled in each of the past four years (top sopranos average from $11,000 to $20,000 a performance, and up to $45,000 for a concert). Inside Renée Fleming there is a tiny diva, fighting to get out. She counts on husband, Rick, to keep her in touch with who she really is and always has been. When she comes home and says, "I'll have the coffee in the living room," he answers, "There's the coffee and there's the living room."

Renée and Rick try to be apart no more than six weeks at a stretch, even though she is on the road 10 or 11 months of the year. If he is unable to establish a satisfactory acting career, he can imagine them living in the country and having children; he will be the househusband—or travel with Renée and the kids.

Already the two of them have been experiencing the hard life of opera. She will be in Europe for eight months this year. "I'm away from my family, friends, everybody close to me," she says. "You can be very lonely, the only English-speaking person for miles." During 1989, her first constant year of work, Renée had a recurring nightmare. In it, members of her family were being hurt, and she could not get to them.

Right now, opera demands 90 percent of her life. When not practicing, learning scores, studying obscure works when they are offered, she is saving herself for singing—resting, staying out of smoky bars and loud restaurants where she has to shout, watching her health, and avoiding alcohol, which dehydrates her body and thickens the mucus on her vocal cords. "I'm pretty boring," Renée says, laughing.

Some singers are paranoid about drafts, wear scarves indoors and out, are terrified of being out in the world, where they might catch cold. A few refuse to talk at all for a day or two before a performance. Says Marilyn Horne: "I don't think there's anything more difficult than the life of an opera singer. There's nothing like having your instrument in your throat where you can have postnasal drip."

In Act I of *Ghosts*, Fleming cannot completely enjoy herself till she has successfully negotiated a classic opera problem, which occurs during a lyrical love scene with Cherubino (sung by Stella Zambalis). Hand in hand the Countess Almaviva and Cherubino move to a bench at the rear of the stage, where the sound of the orchestra is weak and largely overwhelmed by the performers' own voices. Already afraid that she is out of sync with the orchestra, Renée has to kneel, then actually lie down. Barely able to see the conductor, she sneaks looks at a TV monitor in the wings. The duet evolves into a quartet in which Beaumarchais takes up the same theme to court Marie Antoinette. Both are far away at the front of the stage, their voices barely audible to Renée, the sound merging into that of the remote orchestra. She and Zambalis sing bravely away, hoping all the sounds blend together.

During an offstage moment in the first act, Renée finds Marilyn Horne and thanks her for the gift of a sterling silver slicer for cutting out newspaper clippings, and a card saying, "This should come in handy for all the wonderful things you'll read about yourself." Otherwise she rests quietly in her dressing room, warming up the coming arias, and reading the notes that came with presents and flowers. The composer, John Corigliano, and librettist, William Hoffman, the playwright of *As Is*, wrote, "You're just wonderful. Every time you sing we weep. Your talent is awesome. Working with you has been a privilege."

Renée is onstage most of the second act. When the curtain descends, she is badly bothered by three imperfect notes she sang. But then the curtain rises and the cast, standing in ranks, take their bows. When she steps out for her solo bow, the clapping and cries of "Brava!" seem to mingle into a vast roar. When she lowers her head, her adrenaline rush is so great, she trembles and has to concentrate to keep from falling over. Tears fill her eyes—which are smiling.

The aging Countess, Renée touches audience singing "Oh thieving time, give me back my stolen years."

Winnie Klotz

Before the Games could begin, they had to be invented

With the Olympics once more upon us, artist Dennis Dittrich takes a droll look at the ancient origins of several contemporary sports

Exhibiting only slightly more grace than charm, beefy Vikings glide over ice on skates made of animal bones strapped to their feet with thongs. Skating originated in Scandinavia sometime before the birth of Christ.

Spatula-wielding front-runner shows classic form as he leads his fellow Greeks past a temple. The earliest Olympics on record were held in 776 B.C. A footrace was the sole event, and the proud winner was a cook.

Aztec in traditional garb and tank top slams ball through a stone hoop attached vertically to pole. In game of *ollamalitzli*, players used hips and thighs to propel ball. Winners were awarded clothes of spectators.

Teammates guzzle and an Egyptian bowls while another keeps score. Stone implements for a game similar to modern bowling (but probably even noisier) were found in tomb of a youngster buried around 5200 B.C.

Tennis, France's national pastime for centuries, started out as a favorite at court. But the royal attraction proved fatal, *hélas!*, when Charles VIII, en route to a tennis match, died after banging his head on a low doorway.

Shepherd prepares to pitch a pebble toward a rabbit hole, using his staff as a club. Thus, as legend maintains, did the game of golf originate on a sheep pasture that would become the world-famous St. Andrews course.

With the greatest of ease, an ageless Chinese acrobat performs handstand on flying rings. Some gymnastic sports have been traced all the way back to the ancient civilizations of Persia, India, Greece and China.

Bright, sweeping rotunda dome rises 106 feet; it is decorated with the original mosaics by Winold Reiss.

By John Fleischman

Cincinnati's big white elephant has changed its spots

The 1933 Art Deco extravaganza that started life as a train station has metamorphosed into the Midwest's newest cultural attraction

Bypassed by trains, the defunct terminal once housed a shopping mall—till someone had a much better idea.

Sooner or later it will be seen that Cincinnati's Union Terminal was the right building at the wrong time, though for its first half-century it appeared to be the wrong building, too. But then, Cincinnati had always had bad luck with railroads. It had little to show from various rail plans before the Civil War; afterward, when no major city could prosper without a major line, the city fathers were seized by railroad frenzy. The Union Terminal complex was to be the grand leap forward into the new rail age—a $41 million Art Deco extravaganza to assert the city's importance as a rail hub. The terminal opened in 1933; within 20 years it was dying, along with the nation's passenger service, and in 1972 the last train pulled out of the station. In the following hard-knock years, the white-elephant structure seemed doomed. How times have changed.

Last fall, Union Terminal finally came into its own as the Midwest's newest educational and cultural attraction. The Museum Center at Cincinnati Union Terminal, to give the place its formal name, opened its doors on two acres of the best and latest in "immersion environment" museum exhibits. Among the many wonders that it features is the first ice age seen in these parts in almost 20,000 years.

A walk-through ice age and limestone cavern

This new ice age began four years ago with a bulldozer running around with its headlights on in the unfinished basement of the old station. It was a big bulldozer, but in the immense darkness it looked like a toy. Union Terminal has a way of dwarfing big things. There are not many buildings in the world that have a 160,000-square-foot basement, big enough for a walk-through ice age complete with extinct megafauna resurrected in fiberglass. It would also swallow up a limestone cavern that will have a resident free-living bat colony, and an almost-full-scale re-creation of Cincinnati's Public Landing (p. 110)—with a side-wheel packet nosing in circa 1855, a time in local history when a journeyman printer by the name of Sam Clemens shipped out as a cub pilot to eventual fame as Mark Twain. And that was just the basement.

The bulldozers are finished. The river for the riverboat is plumbed and flowing. The giant ground sloth has its taxidermic eyeballs. The "Lab Rats," teenage science guides, are trained. The lights have come up on all the wonders that brewed for so long in the dark. The Center had a first-phase opening in 1990 that included the Children's Discovery Center, the new Cincinnati Historical Society library, an Omnimax theater and a 10,000-square-foot gallery for special exhibitions. With the opening of its permanent installations, the Center now offers 85,000 square feet of exhibit space, with another 100,000 left for future expansion.

The complex is a finely crafted three-way alliance of two older institutions—the Cincinnati Museum of Natural History and the Cincinnati Historical Society—with the new, nonprofit Museum Center Foundation they created to operate the terminal. Together they anticipate a million visitors annually at the 59-year-old architectural masterpiece that had become a technological orphan (SMITHSONIAN, June 1974). To cover the considerable operating overhead, the Center has gone

Photographs by Gordon Baer

Fiberglass mastodon gets mired in Pleistocene bog (it's real water) in Museum of Natural History exhibit. Birdsongs and animal sounds add authenticity as passenger pigeons fly among fiberglass-and-plastic trees.

into the movie and meeting businesses: the five-story Omnimax cinema dome hosts seven vertigo-inducing shows a day; the terminal's vast rotunda and cavernous old dining rooms can be rented for events from weddings to conventions. Union Terminal is alive and well and as busy as it ever was in railroad days.

Ironically, it is also a train station again. Last July the first train in 19 years—the Chicago-bound Amtrak service from Washington—pulled in to a remodeled platform at the rear of the complex, officially marking the rescue of one of America's grandest railroad stations, one that seemed ill-starred from the start.

Cincinnati had originally bet on water transport. By the early 1850s, steamboats and canalboats had made it the economic capital of the nation's interior, the sixth-largest city in North America—and the fastest growing. Then came the Civil War, and its Southern markets went up in smoke. Later, Cincinnati found that the major railroads had bypassed it for Chicago and Cleveland. Eventually the city patched itself into a rail network, but by the turn of the century it was chiefly known to passengers as a bottleneck and a nightmare transfer point. Seven lines served five stations that were scattered downtown, with people dashing between. Forward-looking forces called for a unified station, but floods, inter-railroad squabbling and World War I delayed the plan until the 1920s. The Cincinnati Union Terminal Company chose the New York architectural firm of Fellheimer & Wagner, which designed a state-of-the-art terminus crowned by a 106-foot-high, reinforced-concrete half-dome. The Art Deco look was the contribution of Philadelphia architect Paul Cret. Local wags said it looked like a giant table radio.

The timing couldn't have been better—or worse.

John Fleischman has lived in Cincinnati since 1979. He says he grew up in an era when railroads seemed to be doing all they could to drive passengers away.

Funds for construction were raised in the happy days of 1929 but spent at Depression prices after the stock market crash—the terminal was the maximum building for the money. It could handle 17,000 passengers and 216 trains a day, with bus and taxi ramps that led to the 20,000-square-foot rotunda. Circling the rotunda wall were Winold Reiss' mosaic murals of local and U.S. history—a panorama of whiskered river pilots, stoic pioneer wives, brawny high-steel workers, black roustabouts and bewigged Revolutionary War heroes, all twice life-size. The city had finally arrived in the modern railroad age. Alas, the age was passing. The peak of U.S. rail passenger traffic had been reached a decade before the first train pulled in to Union Terminal.

Directors of the terminal thought the end of the Depression would mean better days. They were right—for a time. World War II was its short golden age. Cincinnati was a major North-South transfer point, and traffic swelled beyond the wildest estimates—20,000 passengers on some days. Rows of sleeping soldiers and sailors, each with a wake-up tag tied to his jacket, lined the concourse waiting for connections. Then came peace, cheap gas, Interstates and airlines. And then came the end, far faster than anyone had imagined. The number of trains was down to about 60 a day by the 1950s, to 24 in the '60s and to 2 in the early '70s. And then there were none. On October 29, 1972, Amtrak moved its twice-a-day service to a shed near the river. Union Terminal entered its darkest period.

Cheap ironies abounded. Cars, trucks and planes continued to torment the place. The rail yard behind it was sold to Southern Railway, which wanted to tear down the long passenger concourse to allow headroom for its new piggyback freight cars, many of them loaded with truck trailers. Directly in the path of the wrecking ball were 14 of Winold Reiss' mosaics depicting local industries. At the last minute, the murals were saved and moved to the airport, Cincinnati's new front door.

The hidden benefit of reinforced concrete

The city acquired the terminal for $2 in 1975 (the land under it cost another million) and tried to lease it for a dollar a year to any serious developer. The only taker converted it into a shopping mall that opened in 1980, just as a recession was shaking the regional economy to its core. By 1984 the mall was all but dead, the developer and city in court. Cynics said the only thing standing between the terminal and demolition was the high cost of destroying all that reinforced concrete.

A rescue, or more accurately, a resurrection, was in the wings. Back in the late '40s, one of the passengers who hurried through the still-bustling rotunda was a 10-year-old boy on his way to see his grandparents in California. E. Verner Johnson had driven up with his

Terminal's main facade is a semicircle of limestone and glass (wags once likened it to a giant table radio).

DeVere Burt, E. Verner Johnson and Gale Peterson collaborated in creation of the new Museum Center.

Cincinnati's new Museum Center

Greg McDonald, curator of vertebrate paleontology, is embraced by copy of giant ground sloth skeleton.

"So *this* is what it's like inside an ice cave": cold, wet air, and haunting sounds of glacial creaks and groans.

family from Lexington, Kentucky. His excitement began at the terminal's Art Deco front doors and continued for two days in all the glamour and class of a transcontinental train ride in that long-lost era. Johnson never forgot stepping into the rotunda and staring up at the giant mosaics. Years later he studied architecture at the Massachusetts Institute of Technology and opened a Boston practice that specializes in museum design. In the late '60s he helped plan a short-lived experimental science center for the terminal's concourse. It was a great success with the crowds but a financial disaster when the start-up federal funding ran out.

In 1980 Johnson was back in Cincinnati to consult with the Historical Society about its future. Founded in Columbus in 1831, the "Historical and Philosophical Society of Ohio" had moved to Cincinnati in 1849; it became the Cincinnati Historical Society in 1963. Over the years, the society had built an impressive library but made little effort to collect objects other than paintings, prints and the odd steamboat model. Having outgrown its existing quarters, it hired Johnson to sketch out various options, including a new direction for it as museumkeeper. Among the alternatives he presented was a joint venture with the Cincinnati Museum of Natural History, but his projected budget caused the society's board to turn deathly pale. Johnson saw the two institutions as natural partners, and wanted to coax the historians and naturalists into considering an alliance. But they were mutually suspicious and skeptical, he recalls with a laugh. The idea was rejected.

Natural History's first employee: J. J. Audubon

The Museum of Natural History traced its roots to 1818. The frontier doctor and savant Daniel Drake had put the first employee on the payroll in 1819—a bankrupt painter by the name of John James Audubon. After stuffing birds for eight months, Audubon floated off on a flatboat bound for New Orleans, aiming to shoot and sketch birds along the way. Meanwhile, the museum grew steadily but didn't hit its stride until the 1930s, as a major center for archaeological and wildlife research in the Ohio Valley. Its master artificer, the late Charles Oehler, helped create a crowd-pleaser in 1969—a walk-through, eerily accurate "limestone cavern" made of odds, ends and spray-on fake rock called Gunite. By the early '80s it was bursting at the seams with bones, feathers, artifacts, exhibits of Indian life, wildlife tableaus and a planetarium. But expansion plans were to be blocked by local geology. Engineers wouldn't even allow test borings on the hillside behind the building—it was too unstable.

In 1984, with only four years until the city's bicentennial, the two organizations took another look at Johnson's proposal and hired him to analyze sites for a

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Confetti showers group in Historical Society's World War II exhibit commemorating the varied experiences of Cincinnatians in wartime—here, it's V-J Day. Union Terminal was a major transfer point for the military.

joint project; one of the 50 he looked at was Union Terminal. Realizing the possibilities offered by the structure, which was regarded by both clients as the black hole of good intentions, Johnson lured Natural History president DeVere Burt and director Gale Peterson of the Historical Society into the terminal basement. Neither man had envisioned the full potential of such a space. The building had been constructed on 5.5 million cubic yards of fill dirt. To raise it to its proper height, a vast area—160,000 square feet with a 24-foot ceiling—had been left unfinished under the front. Cars and trucks had once parked there, but the place had faded from memory long before the trains did. As the men marched by flashlight across this indoor plain, Johnson pointed out that here was room for two very big museums—the total building had nearly 500,000 square feet of usable space—and that on a dollars-per-square-foot basis, a remodeled terminal would be far cheaper than new construction.

It was the terminal that saved the day when bonds for the proposed museum went before the voters in 1986, Johnson maintains. The bond issue squeaked through, he says, because people couldn't bear to see the structure destroyed, particularly those who associated it with World War II—the portal through which thousands had left for war work and war duty, and the reunion center for the lucky ones who made it back.

Inside the rescued rotunda it still looked 1943-ish. The murals that remained were in perfect condition. During the shopping mall years, a discount clothing outlet had been built around the avant-garde (for 1933) digital clock in the center, but once the dress racks were removed, the multicolored terrazzo floor stretched unobstructed to the ticket windows, the old checking lobby and the entrance to the newsreel theater where the troops had drowsed through *The March of Time*, waiting for trains. As its major opening attraction the Historical Society offered "Cincinnati Goes to War," an exhibition on the World War II home front. Reviewing everything from draft boards to ration books, the exhibit winds around on the old bus and taxi ramps. From there, visitors are led to a "time trail" that takes them back to the founding of Cincinnati in 1788 and down into the wonder-filled basement.

Here the themes center on the Ohio River and how it brought both settlers and prosperity to the opening frontier. Ruby Rogers, director of the society's history museum, says that its lack of a large collection of artifacts allowed the designers, led by consultant Jean Jacques Andre, to tell the story of the city's development rather than create showcases for objects. "Sure, there are people in the museum field who don't like this ap-

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At Public Landing, visitors can board side-wheeler *Queen of the West* (right) and stroll down Front Street past the Coffee House, ship chandler's and other sights that evoke the heart of Cincinnati in the mid-1850s.

proach," she says, "but how do you deal with something like Fort Washington?" The flag of a regiment that served there has been saved, but little remains of the fort itself—the outpost around which pioneer Cincinnati clustered—beyond a few partially rotted timbers recovered when a garage was built over the site in the late '50s. The timbers, while important, don't say much on their own, notes Rogers. But on the time trail, visitors walk through native forest toward a section of reconstructed stockade, pass under its rifle loops and hear the sounds of military drill. Inside, a life-size figure of an Army private stands near wall texts that describe the equipment and life of a frontier soldier.

The climax of the time trail is the Public Landing (above), where it's perpetually twilight and 1855 or so. The paddle wheel of the 94-foot-long *Queen of the West* turns slowly to hold her against the current as she unloads after a run down from Pittsburgh. The river pilot, a member of the museum's cast of historical characters, is at the gangway to see off the last passengers and drum up trade for the return run. You don't want to be putting off any upriver business, he tells a family of likely prospects, or you could be left high, dry and stuck downriver until the fall freshet.

If it's 1855 on the riverfront, it must be 19,000 B.P. (Before Present) on the other side of the terminal where, in the Museum of Natural History, "Cincinnati's Ice Age: Clues Frozen in Time" conjures up a scene never witnessed by human eyes—a lobe of the Wisconsin ice sheet in its death throes. Streams shooting off the retreating ice face cut through the glacier's outwash debris, forming a gorge that will one day be the central feature of Sharon Woods park, on the north edge of the city. It's a dream landscape that was largely the dream of Charles Oehler and later of DeVere Burt, who began a decade ago to talk about an exhibit that would take visitors *into* the Ice Age. Burt wanted to send people straight through the heart of a cold, slightly wet and loudly groaning glacier, and out through a magical blue ice cave (p. 106) onto the periglacial tundra. There they would see the vanished megamammals of the Pleistocene—the giant sloth, saber-tooth cat, mastodon, dire wolf. And alongside these, the tiny contemporaries that survived—the squirrels, chipmunks, birds. Burt compressed a 30-mile-wide ecological transition zone into 220 feet of multisensory assault: 70 incredibly detailed animals, the sound of birds, the effect of clouds passing over the sun, and the astringent smell of pine as visitors enter the stand of evergreens. And all of it had to be accurate, sturdy and washable—hosable, in fact. Nothing shatters illusion faster than a dusty mastodon standing next to a fuzz-covered pine.

Under the guidance of paleontologist Greg McDonald and exhibits director Sandra Shipley Toombs, the museum set up a fiberglass-animal workshop to sculpt in clay, and then cast, scrupulously accurate conceptions

of the Pleistocene creatures. Muralist John Agnew painted 4,500 square feet of plains, swamps and valleys as background. Broadway lighting designer Beverly Emmons (*Amadeus*) lit the late Ice Age. The museum sent teams to Alaska, Greenland and Iceland to explore glaciers and make a foray into an ice cave. "They are extremely dangerous places," says Burt. "A reservoir in the ice can burst upstream without warning and fill a passage in seconds. It's also one of the most beautiful environments on Earth, everything lit in blue." Union Terminal offers the world's only safe ice cave.

Then there's the new, improved limestone cavern based on the museum's original, but longer and more realistic. Visitors will look through windows into an experimental free-living bat colony whose access to the outside world is via a 100-foot-long tube. No one has ever established such a colony, says zoologist Bob Kennedy. He and a team of staff and volunteers are writing the book on free-living-bat management as they go along. They plan to get pregnant bats from maternity colonies, some threatened by exterminators, and have the females give birth in the chamber—at which time the tube will be sealed. Once the young are old enough, the tube will be opened, and the bats allowed to come and go as they like. It's hoped that the young will imprint on the terminal bat colony as their native ground and return to breed there. The first residents are to be big brown bats (*Eptesicus fuscus*). If the big browns work out, little browns (*Myotis lucifugus*) will come next. If the little browns make it, Kennedy wants to try an endangered species, the Indiana bat. Thus the colony will teach a fearful public, prejudiced in part by Dracula movies, that bats are useful, nonmenacing animals. It could also be a desperately needed haven for threatened bat species. The first step in making the bats feel at home is to give the glass-sided colony chambers a proper bat smell; so, along with the bats, Kennedy is collecting a supply of bat guano and urine to spread on the walls.

The visitors' area of the cavern also needs a proper smell. The loading of the yet-to-come smell machine fell to Sandy Toombs. She went to International Flavors and Fragrances in Manhattan, the people who had found her a pine smell for the Pleistocene evergreens—one that didn't remind her of bathroom freshener. IFF had in stock a bottle of "Cave Essence."

"Have a smell," says Toombs, offering a whiff from the tiny bottle; "the smell of moldy leaves does it." Indeed it does. "I'm being fairly subdued about all this," she says, "but I'm dying to try this out on people."

Stalactites, stalagmites, flowstone formation (front) are just a sampling of the limestone cavern's delights.

By James A. Cox

'Tokyo Bombed! Doolittle Do'od It'

Early in 1942, a mission-impossible strike against five Japanese cities gave us hope and brought consternation to our enemies

On January 10, 1942, Capt. Francis S. Low, a submariner on the staff of Adm. Ernest J. King, flew to Norfolk, Virginia, to check the progress being made on the USS *Hornet*, the Navy's newest carrier. As Low's plane banked over the naval base, the captain spied the outline of a carrier flight deck painted on the tarmac below. The dummy deck was normally used by Navy pilots to practice carrier takeoffs, but as Low looked down, two twin-engine Army bombers were making simulated bombing runs on it.

What happened next—and there are those who doubt it happened at all—was either the hand of Providence or one of history's great coincidences. As Low watched from above, the angle of the sun made the shadows of the attacking Army bombers run along the carrier deck as if in takeoff. Lights flashed and bells clanged in Low's mind.

When the captain got back to Washington, he hit the ground running. A staff car delivered him to Admiral King's unofficial flagship—the former German yacht *Vixen*. Low was admitted to King's study. It was a frosty moment. But the stiff-necked admiral, reliably reputed to eat an ensign or two each day for breakfast, thawed considerably as Low talked. He asked air operations officer Capt. Donald B. Duncan to get a feasibility study. Seven days later, study in hand, King called Gen. Henry H. (Hap) Arnold, head of the Army Air Forces. Arnold raised a few technical questions and asked for some time to think over the idea. After his Navy visitors left, the general picked up the telephone. "Get me Doolittle!" he barked.

And so began a bizarre and heroic

At 8:20 A.M., April 18, Doolittle's heavy-laden B-25 lifts off from the USS *Hornet*, 700 miles from Japan, leading a strike force of 16 planes. A bombing raid had never been launched from an aircraft carrier before; pilots had to keep left wheel on outer line to keep plane's right wing from hitting the *Hornet*'s island. Above: Yokusaka Naval Base was photographed by one of Doolittle's raiders. At right: As a young lieutenant, Doolittle set two international seaplane speed records in 1925, the first of many flying feats achieved before the historic top-secret Tokyo raid—its planes, FDR said, came "from Shangri-La."

aerial exploit that stirred the flagging spirits of Americans and our beleaguered Allies in the darkest years of World War II. Europe was a German concentration camp. Hitler's armies were plunging deeper into Russia, while Desert Fox Rommel had all but swept the British out of North Africa. In the Pacific, the Japanese seemed unstoppable. Much of the once proud American Pacific Fleet was crippled or on the bottom in Pearl Harbor; the Philippines seemed about to fall.

Fifty years after Hap Arnold's phone call, James Harold Doolittle is still a peculiarly American hero. A daredevil flier, he was also a calculating engineer like Lindbergh, with a doctorate in aeronautics from the Massachusetts Institute of Technology. Even today, at 5 feet 4 inches and 140 pounds, he can still fit into his old brigadier general's uniform, and though, at 95, he is somewhat hard of hearing, he has just collaborated on the story of his life, *I Could Never Be So Lucky Again.*

A pioneer of instrument flying, he has been a chill 'em, thrill 'em stunt flier and a world-famous airplane racer. As commander of three U.S. Air Forces, he helped orchestrate America's overwhelming air attack in Africa and Europe during World War II. Yet what his countrymen remember him for best is the remarkable bombing raid from the carrier *Hornet* that resulted from Captain Low's vision and General Arnold's call. There is a sense in which Jimmy Doolittle's life and experience, from the time he was a small boy in Alaska until the famous flight in April 1942, had been fatefully preparing him for that one extraordinary exploit.

He was born in Alameda, California, in 1896, to a carpenter father and a local beauty named Rosa Shephard. His father was a man consumed by wanderlust, and the family followed him to the Alaska gold rush in 1900, staying till 1908. In rough-and-tumble Nome, a place of saloons and ankle-deep mud, a peanut-size little kid with long, angelic curls like Jimmy's had to learn to defend himself. Back in California, while attending Los Angeles Manual Arts High School, at age 15 he won the amateur flyweight championship of the West Coast.

By 1910 he was already a nut about airplanes. The lure of flight didn't permanently change his life, however, until 1917 when he gave up work on a degree in mining engineering from the University of California at Berkeley to enlist. As it turned out, he was such a good pilot that it interfered with his wartime ambitions. Instead of high adventure over France in Spads or Nieuports, Doolittle spent the rest of the war as a flight instructor.

It rankled him that he never got into combat. But he did spend hours in the air, trying every kind of aerial maneuver he had heard of or could imagine, testing both himself and his machines to the limits. In 1921 Doolittle was part of the group that demonstrated Gen. Billy Mitchell's thesis about battleships being vulnerable to

air attack. Mitchell was right, of course, but being right ruined his career. The Army did better by Doolittle. It sent him to MIT to study aeronautical engineering. By 1925 he was Dr. Doolittle, with an ScD in aeronautical science, one of the first in the United States.

In 1922 he became the first pilot to fly solo coast-to-coast in less than 24 hours. In 1925, on back-to-back days, he twice broke the world seaplane speed record. His best time was 245.7 miles per hour. On September 24, 1929, in a plane with a hooded cockpit, he became the first pilot in history to fly "blind." Using only a radio, an artificial horizon, an altimeter and a gyrocompass, he took off from Mitchel Field, Long Island, followed a rectangular pattern and landed at Mitchel again—without ever seeing the ground.

Peacetime promotions were slow. As a first lieutenant earning less than $200 a month, Doolittle was trying to support a wife and two sons, besides taking care of a mother and mother-in-law. In 1930 he quit the regular Air Corps to join Shell Oil Company's new aviation department in St. Louis, at triple his Army salary.

The 16 Mitchell B-25s were lashed to the deck as the *Hornet* and her escorts headed west toward the Land of the Rising Sun.

Preparing for the flight, bomber crews load belts of machine gun ammunition.

Some brother officers saw it as a sellout. But Doolittle, borrowed by the Curtiss-Wright Corporation, was soon headed for Europe to showcase four new Curtiss-Wright planes. Other trips followed. Naturally he met many foreign airmen and, especially in Germany, saw the latest aviation developments. Soon he began pestering Shell to develop a higher-octane aviation gasoline. It would cost more than the 15 cents a gallon charged for standard fuel. In the depths of the Great Depression nobody, including Shell, wanted to foot the bill.

"That's when I learned of the advantages of an advanced degree," Jimmy says with a small smile. "I am sure that Jimmy Doolittle the stunt pilot and Jimmy Doolittle the racing pilot would not have been able to influence them," he recalls. "But I went to them as Dr. Doolittle."

Shell eventually took the gamble. Initially, the fuel cost more than $2 a gallon to make but, Doolittle explains, "we sold it for 50 cents a gallon to develop the market." At Shell, the project was known as "Doolittle's Folly." Within a decade, though, the 100-octane aviation gas supplied by Shell, and then other refiners who followed suit, made possible the U.S. air power that helped turn the tide of battle in World War II.

During his European trips he'd seen production of planes and engines in Germany and realized that Hitler was paying no attention to the Versailles Treaty at all. After Germany annexed Austria in the spring of 1938 and took over Czechoslovakia (SMITHSONIAN, October 1988), Doolittle visited General Arnold, offering to serve "full-time or part-time, in uniform or out, in any way he thought would be useful."

Finally, on July 1, 1940, the Army Air Corps brought him back on active duty with the rank of major. His job: helping Detroit retool to produce

The author has written in these pages on such topics as World War I planes and the life of prizefighter Joe Louis.

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planes and tanks instead of automobiles. On December 8, 1941, Doolittle fired off a letter to General Arnold requesting combat.

What he got was a desk in Washington and promotion to lieutenant colonel as a member of Arnold's staff. He was 45 years old. It looked as if one of the world's great fliers was about to miss his last chance at combat. Then, hardly more than a month later, General Arnold growled "Get me Doolittle!" over the phone.

Doolittle's job was simple: make the Arnold-King plan work, and in less than three months. From the start, it was a one-shot gamble against outrageous odds. Flying large bombers off an aircraft carrier! It had never been done before. Hitting Tokyo and then flying on to China! That was all but impossible.

After bailing out over China, Doolittle located the wreckage of his plane, and was photographed sitting glumly near one wing.

Cloaked in secrecy and beset with technical problems, the Tokyo raid was just the kind of complex caper that, as a high-tech film today, would keep audiences on the edge of their seats but put an unbearable strain on their suspension of disbelief.

The bombers chosen, North American B-25 Mitchells, normally lifted off at about 95 mph, and required more than 1,000 feet of airstrip to do it in. Now they would have to take off in under 500 feet, traveling at 45 mph, and from the pitching flight deck of a carrier, the USS *Hornet*, in a space narrower than their own 68-foot wingspan. The Mitchells' normal operating range was about 1,400 miles, but to hit the Japanese cities and fly on to airbases in China, as planned, would require a longer flight than that (map, below).

Map shows the distances and course of the raid. One flight landed in USSR.

Doolittle had no trouble getting volunteers for an "extremely dangerous mission." However, none of the pilots, navigators, engineers, mechanics, gunners and radiomen who began assembling on February 27, 1942, at an unused auxiliary field near what is now Eglin Air Force Base in Florida, had any idea what would be demanded of them. In fact, until they were safely at sea, only Doolittle, Hap Arnold, Admiral King and four other officers knew where they were bound.

At Eglin they practiced cramped, short-field takeoffs from distances marked by flags stuck at intervals on the runway, and worked at night-navigation exercises. They helped modify the B-25's specifications. To increase range, additional gas tanks were installed; still, ten five-gallon cans of raw gas would have to be carried in the tail end of the fuselage, perilously increasing the risk of fire.

To save more weight, the bottom gun turrets had to be removed. Radio transmitters were shed, too. Too heavy. Besides, during the actual strike, crews would be forbidden to communicate with anyone for fear of compromising the operation. Mitchells had no rear gun turrets, so Doolittle had broomsticks installed and painted black, hoping to discourage any Japanese fighter planes that got on their tails.

Everything had to be done in a matter of days if they were to get to sea by early April, and glitches plagued Doolittle every step of the way. The new .50-caliber guns refused to work. The fancy new ultrasecret Norden bombsights, reputedly able to put a bomb into a pickle barrel from 20,000 feet, had to go. It was so early in the war that America could not risk a Norden falling into enemy hands. In the machine shop at Eglin, Capt. Ross Greening designed what he called a "Mark Twain" sight. Made of aluminum, it somewhat resembled the "post and V" sights of a Daisy Air Rifle, was accurate at low levels and cost the taxpayer only 20 cents apiece.

The mission clearly needed a medical doctor, but weight was such a factor that in order to go along, the flight surgeon, Lieut. Thomas R. White, had

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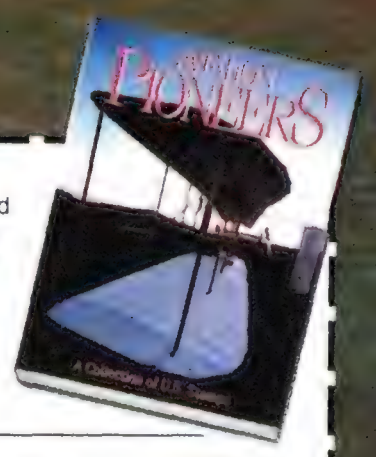

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to qualify as a gunner. White did that, scoring second-highest among all members of the crews. It was White's job to take care of administering vaccination shots. When Doolittle's volunteers found themselves taking 11 shots in two weeks, including bubonic plague, yellow fever and typhus, they assumed they weren't bound for any cold climate. But Doolittle forbade them to speculate about the mission, even with wives or sweethearts.

All this happened just at a time when, after years of isolationism, the United States was desperately trying to switch gears into war. With only weeks until the takeoff deadline, and unable to explain to anyone why he was in such an all-fired hurry, Doolittle desperately shuttled back and forth between Eglin, Wright Field outside Dayton, Ohio, and Washington, D.C., wrestling with military red tape and balky civilian contractors.

Time and again when higher officers and technicians refused to take the mysterious mission of this pepery, pint-size lieutenant colonel seriously, he had to invoke Hap Arnold's name and rank. Time and again, dealing with manufacturers, he had to bring to bear his training as an engineer and his ten years in private industry. In his autobiography, written with Carroll V. Glines, Doolittle admits that there were times when he employed invective that he never felt the need to use again. In print, Doolittle is modesty personified. In retrospect, there is little doubt that had anyone else been saddled with the job, the raid would never have got off on time, or perhaps at all.

The carrier *Hornet* put to sea on April 2 with the final 16 qualifying Mitchells safely lashed to her flight deck. It was only then, when no further communication to the mainland was possible, that the 80 volunteer Tokyo raiders learned their destination. They got used to Navy-style showers (almost waterless) and pored over maps of their five targets: Tokyo, Yokohama, Kobe, Nagoya and Osaka.

Briefed by Navy intelligence, they were advised that if confronted by Orientals, those who grinned would be Japanese; those who bowed and smiled, Chinese. They practiced saying something that sounded like "Lushu hoo megwa fugi," hoping it really meant "I am an American" in Chinese. To save fuel, each pilot was asked to pick targets that lay in a straight line, confine himself to things like docks, shipping, refineries, and, Doolittle insisted, avoid anything that could be interpreted as an inhuman and barbaric act.

The raid had been planned as carefully as circumstances permitted. The planes would take off 450 miles from Japan, come in low along a 50-mile front, drop four bombs apiece, dive low, almost to the deck, to avoid interception, then head south, then west, across the China Sea. The Chinese and Gen. Claire Chennault, commander of the Flying Tigers, a volunteer fighter group already flying against the Japanese for China's Generalissimo Chiang Kai-shek, had been asked to set up radio homing beacons at coastal airfields, to help survivors of the raid find their way.

It was a long way to China from Tokyo (about 1,250 miles). A shorter, safer escape route, to Vladivostok in the Soviet Union, had been denied them. Despite repeated requests, the Russian government absolutely refused to let any U.S. bomber coming from anywhere land and refuel.

Every scrap of evidence that might link downed crewmen and their aircraft to the *Hornet* was left aboard the carrier. (The secret of this launching was so well kept that, weeks after the raid, no one knew where the planes had come from. When queried at a post-raid press conference, President Franklin Roosevelt blandly replied, "They came from our secret base at Shangri-La.") Overtly anti-Japanese slogans were forbidden on plane fuselages, in hopes that if downed crewmen were captured, they might be better treated. Even so, some of the 16 Mitchells acquired the kinds of names that would become familiar in later bombing missions over Germany: *Green Hornet, Ruptured Duck* (for the Mitchell's unusual twin-tailed design), *Bat Out of Hell, Hari-Kari-er,*

Fliers (from left) Campbell, Williams, McElroy, Bourgeois, sport parasols in photograph with Chinese rescuers who bravely helped them on their way.

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En route to Chungking, happy Doolittle lined up with reunited crew and three Chinese friends. From left: Braemer, Leonard, Cole, Doolittle and Potter.

Whirling Dervish, Whisky Pete, Fickle Finger of Fate and, more bluntly, the chemical formula for TNT.

The bomber crews had expected to be launched a day later—and after dark—but at dawn on April 18, with the *Hornet* still about 700 miles from the targets, their Navy task force was seen by a Japanese vessel. Fearing an enemy alert, the Navy decided that planes must be launched immediately. Flight crews rushed to stow gear aboard. After the gas tanks were topped off, the planes were rocked back and forth to get rid of bubbles in the wing tanks, making room for a few more precious gallons.

The carrier was pitching so much as it headed into a 30-knot wind that waves tossed water over the flight deck, drenching deck crews. Waiting Mitchells revved their engines before takeoff. In plane No. 7, the *Ruptured Duck*, Capt. Ted Lawson (who would write the best-selling book *Thirty Seconds Over Tokyo*, later a Van Johnson-Spencer Tracy film) was outraged at having to burn up 40 gallons of his precious 1,150 gallons of fuel before the mission had even started.

A white line had been painted six feet from the port edge of the *Hornet*'s flight deck. Pilots were told that if they kept their left wheel exactly on that line during takeoff, their right wing would just miss the carrier's island. To help, there was another line farther inboard, which the plane's nose was to follow. At 8:20 A.M., April 18, 1942, Doolittle's Mitchell revved up, was given a go signal, and trundled down the deck and into the air. One by one the others followed.

All crews knew that if anything at all went wrong—an engine stalled, a tire went flat or a wheel edged over the carrier deck into the catwalk—they were to leave their planes instantly so the *Hornet*'s flight deck crews could clear the way for the next bomber by rolling the $150,000 machines off into the Pacific. In 60 minutes, all 16 Mitchells were in the air. There was only one mishap. As the last plane, pilot William Farrow's *Bat Out of Hell*, was starting to rev up, the prop wash of the bomber ahead blew Seaman 2d Class Robert Wall, one of the

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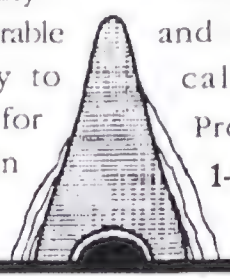
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Hornet's crewmen, toward the *Bat*, and a propeller blade sliced through his left arm. As Farrow lifted the ship off, Wall was rushed to sick bay. For *Bat Out of Hell* and its crew, this turned out to be an ill omen.

Just above the surface of the stormy sea, the planes droned west toward the Japanese homeland. In the rush, some men had forgotten breakfast rations. Others grabbed enough for two. They carried pistols, matches, toilet paper, bandages, morphine and whisky; as usual, Doc White was prepared. He had scrounged 80 pints of "medicinal" rye from the *Hornet*, one for each crewmember. Smokers, frustrated by the stringent antismoking rule, desperately chewed gum. Richard Knobloch, copilot of the *Green Hornet*, kept gobbling oranges and sandwiches. When his pilot complained, he replied, "May as well die happy."

Colonel Doolittle's flight was out ahead. Once his bomber had alerted Tokyo, everyone figured that, as Lawson put it, "every Japanese fighting plane and antiaircraft gun would be ready" to blast later bombers out of the sky. But, like the Americans at Pearl Harbor four months earlier (SMITHSONIAN, December 1991), the Japanese apparently could not believe what was happening. Bad weather and low visibility helped, too. Coming in

Back home, General Doolittle gets the Medal of Honor from FDR.

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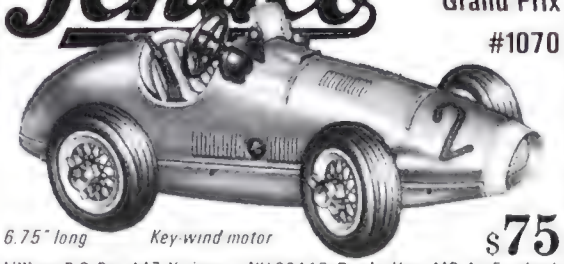
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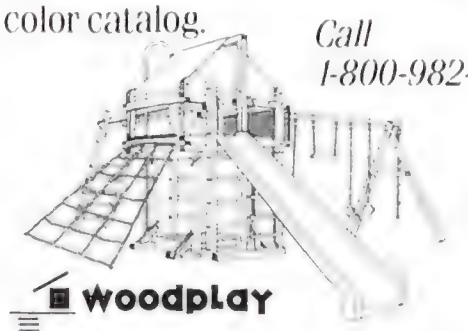
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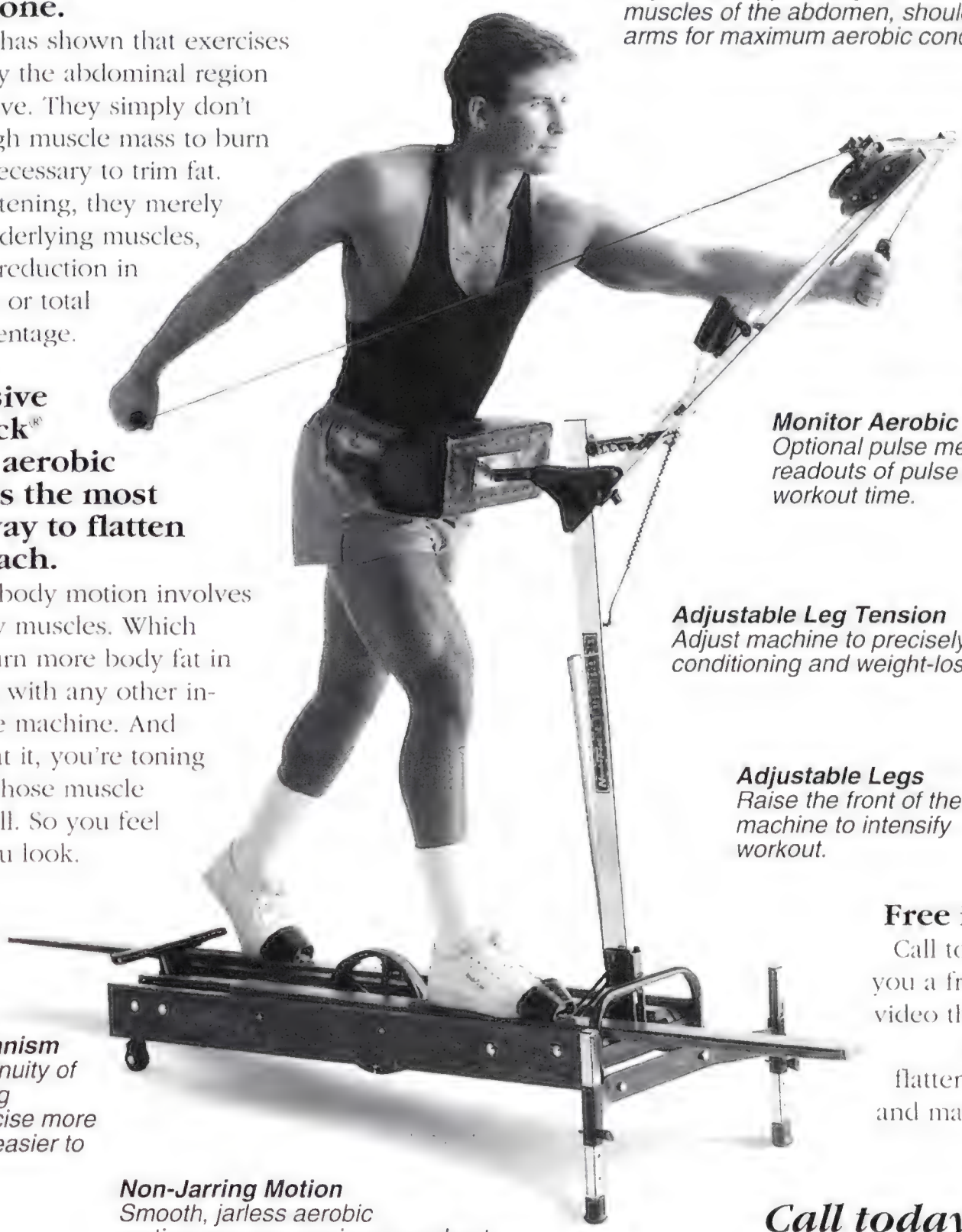

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This photograph of crewmen Radney, Horton, Crouch, Manch, Holstrom, Fitzhugh, Youngblood and Campbell wasn't released until a year after the raid.

low over Tokyo Bay, approaching Yokohama and the more distant Nagoya, Osaka and Kobe, the American planes each dropped their three 500-pound high-explosive bombs on dry docks, shipping, arsenals, oil refineries, a steel mill, barracks and such sites as the Mitsubishi Aircraft works in Nagoya, then loosed one 500-pound incendiary breadbasket, and fled away south. Antiaircraft fire was rare, sporadic and mostly inaccurate. One bomber blundered straight through the landing pattern of a Yokohama airbase, with Japanese planes all around it, but no one recognized it. Six enemy fighter planes wheeled toward another bomber, and one Zero actually pursued but was quickly lost during low-flying evasive action.

It was over in a few minutes. There were no casualties. Only one plane was lightly hit by flak. As they headed away, crewmen got an April glimpse of an exotic enemy land. Towns "like children's play gardens," one flier recalled. A green, fairytale landscape, as another put it, with "a red lacquered temple" and "fruit trees in bloom."

The hard part had been miraculously easy. But now, flying on to China, which had seemed fairly simple in advance—provided the fuel held out—threatened catastrophe. Headwinds held them back. Fuel dwindled. More important, because they had had to take off at 8:20 A.M., they would now be reaching the Chinese coast in darkness instead of daylight. After 13 or more hours in the air, with fuel running near empty, they found themselves in clouds and darkness, lost somewhere over China or the China Sea. In vain they tuned to the frequencies of radio beacon stations they had been told would broadcast from airfields at Chuchow and Luishui. Silence. Because the raid was so secret, nobody had made clear to the Chinese and Chennault's people exactly when, or even why, the beacons would be needed.

One plane, piloted by Capt. Edward (Ski) York and shorter of fuel than the others, tried Vladivostok anyway. It was the only one to land safely, but York and his four crewmembers were held prisoner, almost incommunicado, by the Russians for 14 months. For the 15 other pilots, it was an agonizing choice, whether to ditch somewhere near shore or along a beach, or climb, wait until the gas ran out and jump into darkness, hoping to land more or less safely in terrain unoccupied by the Japanese. Four pilots crash-landed. Eleven plane crews jumped, including Doolittle, who reached earth in the middle of a rice paddy full of night soil.

Wet and reeking, he waited until dawn, keeping warm with calisthenics, then went searching for his crew and the wreckage of his ship. He had no idea where anyone was or how many were alive. What he did know was that, in his first combat command, he had lost most of his planes and very likely many of his men. After finding his engineer, Sgt. Paul Leonard, he located what was left of his bomber and sat by a wing, disconsolate, for once not instantly sure of what action to take. Leonard snapped his picture (p. 116). "They'll court-martial me for this," Doolittle told him. "No, Colonel," Leonard said, "they're going to give you the big medal . . . [and] another plane. And when they do, I'd like to fly with you." In his memoirs, Doolittle notes that the Medal of Honor sounded fanciful to him, but the trust

Blindfolded prisoner, Lieut. Robert Hite, is led off a plane in Tokyo.

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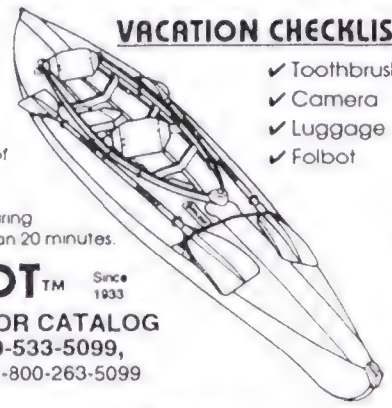

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in his flying skill by a veteran crewman was heartening. Still, he writes, "I never felt lower in my life."

Fifteen planes, intended to be flown on to India and Burma for further combat, were indeed wrecked. Cpl. Leland Faktor died after his parachute jump. Sgt. William Dieter, a bombardier, and Sgt. Donald Fitzmaurice, an engineer-gunner, died after crash-landing. Lawson, ditching the *Ruptured Duck* off the China coast, had his face smashed open and a leg brutally splintered. He would have died had not White heard of his whereabouts and made his way to him.

For days, with the Japanese searching for all U.S. airmen, Doc White nursed Lawson, giving him transfusions of his own blood; he was finally forced to amputate Lawson's infected leg to save his life. Out of 80 men, only 8, including Lieutenant Farrow and the whole crew of *Bat Out of Hell*, fell into Japanese hands.

With the help of brave Chinese villagers, and some British and American missionaries, most of Doolittle's men reached safety. They found themselves, as pilot John Hilger writes,

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"among the people Pearl Buck writes about." They were pushed in rickshas, borne along in rescue sacks made from bamboo and rope netting; they rode in oxcarts or on the backs of mountain ponies, successfully evading Japanese soldiers and Chinese guerrillas. Straggling together into small groups, they limped on to forward airfields all over Chekiang Province and thence, by the end of May, to the Chinese capital of Chungking. There they got medals, and "flower of the moon" fruit preserve from Madame Chiang Kai-shek.

That so many escaped was all the more astonishing given the Japanese fury after the raid. The bombing damage done to Japan by Doolittle's raiders was slight and mostly temporary. But the psychological affront proved to be everything America had hoped for and more. Triumphant headlines of the raid flashed around the world. At home, the papers exulted: "TOKYO BOMBED! DOOLITTLE DO'OD IT!" and the classic banner on the Alaska *Nome Nugget*, "NOME TOWN BOY MAKES GOOD!" For America and our allies it was the only good news from the Pacific since the war had begun.

In China, the Japanese launched an all-out ground-and-air attack on Chekiang Province, capturing all the forward airfields that Doolittle's fliers had hoped to use and, in three months, killing 250,000 Chinese. Ground troops razed all foreign missionary stations and, in search of Americans—or to set an example—put to death hundreds of Chinese peasants. Nothing showed Japanese psychological shock more than the treatment accorded the eight captured American fliers. Flown to Tokyo, they had expected to be treated as prisoners of war. But they were tortured by the Kempei Tai, the Japanese gestapo, including water torture.

When they resisted, confessions were created alleging "indiscriminate bombing and strafing," including the shooting up of a schoolyard and other "outrageous, inhumane, bestial and devilish crimes." The Japanese even created a new criminal statute making it a capital offense to raid Imperial Japan and retroactively found the American fliers guilty. Three men were executed by firing squad—Lieut. William Farrow, Lieut. Dean Hallmark and Sgt. Harold Spatz. The other five were given life imprisonment. In December 1943, Lieut. Robert Meder, copilot of plane No. 6, died in prison of malnutrition.

Jimmy Doolittle was made a general and given the Medal of Honor. His later exploits and ingenuity as commanding general of the 12th, 15th and 8th Air Forces in North Africa and Europe were legion. Yet Sgt. Paul Leonard was wrong about one thing. James Harold Doolittle had acquired too much rank ever again to lead a combat mission. But surely the Tokyo Raid was the one to have if you're having only one.

Every year (as here in 1969) Tokyo raiders meet and toast their departed comrades. When a man dies, his silver goblet is turned upside down.

Book reviews

Game Wars: The Undercover Pursuit of Wildlife Poachers
Marc Reisner
Viking, $19.95

Writers take to Louisiana like alligators to a bayou. I think it's because Louisiana is our most exotic state (on the mainland, anyway). It has a French history, a Cajun culture, feudal politics and a landscape about three-fourths marsh. Louisiana doesn't look or act like other states. I believe it was A. J. Liebling who wrote that the main difference was that Louisiana lacked a tradition of democracy. But as Marc Reisner shows us in *Game Wars*, nature too sets Louisiana apart. "It is, or was, the best habitat for wildlife in the entire world," he writes. Living off the land is still not only possible but practical. Big-time poaching flourishes as well, and it's the poachers and their pursuers, particularly a colorful, arrogant, profane and off-and-on successful federal undercover agent Reisner calls "Dave Hall," who are the subject of this free-swinging book.

"Hall" is what he's called here, but I hope that's not his real name; Reisner doesn't say. If it is his real name, I hope he's made a midlife career switch to something like silk farming or telemarketing because this book is going to blow his cover and probably jeopardize his life. There is money enough in alligator hides and illegal game fish and other contraband wildlife products that murder is not uncommon. Hall, who works for the U.S. Fish and Wildlife Service's law enforcement branch, spends his time conjuring up undercover schemes to nail the entrepreneurs who get obscenely rich trading in illicit wildlife.

Reisner's book is both a page-turning

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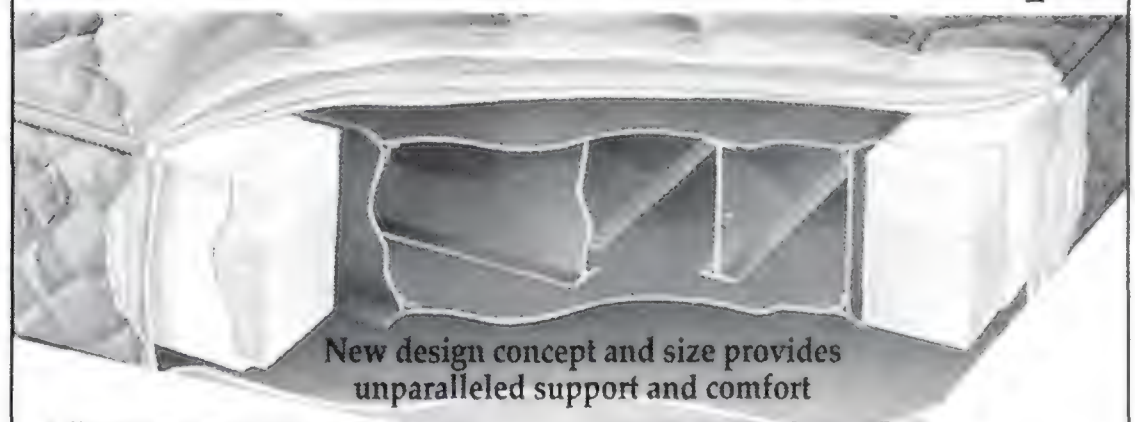

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narrative and an editorial on the decimation of nature by greed, but it's mostly the former. Hall is an irresistible character. When we first meet him he is admiring a flock of geese and on his way to meet a Cajun outlaw known as "A. J." whom he has converted into an undercover operative. Later he demands to know how many alligators the Cajun poached on his best night. The man reluctantly concedes that his record was 114, at an average length of five feet and an average take of $8 a foot. He became Hall's ally after the mysterious deaths of several cohorts—possibly at the hands of competing poachers. Now, Hall says with a smile, here he is taking a notorious alligator poacher to lunch. "Former alligator poacher," the man corrects him.

"I hope that's true," says Hall.

Hall is happy in his work. He loves chasing bad guys, wiring himself with a $5,000 tape recorder and wheedling incriminating conversation out of them. When the trade in illegal ivory boomed in the 1970s he volunteered to lead a sting aimed at nabbing the big-ticket traders in Alaska who deal in ivory from walrus tusks. Good ole boy Dave poses as a new-rich Texan in the oil-lease game who hankers to sell ivory to his friends. His customary cool erodes only when he finds himself at the mercy of an Alaskan version of Hell's Angels known as the Brothers (but I'm not telling what happens).

At one point he submits to a strip search by an ivory dealer nicknamed "Sealskin Charlie" who has his doubts about ole Dave—who has already second-guessed Charlie and ditched his recorder in good time. The Alaska caper is the best reading in the book. I'll never feel the same about the town of Nome after reading Reisner's description (it looked like a "large container spill . . . the world capital of the International Quonset Hut style . . . the landscape was mildly undulating tundra, without trees to set the limits of sight"). A greater contrast with southern Louisiana is impossible to imagine.

The book includes one segment on gator poaching, one on the ivory trade, a third on a lucrative racket in the tasty fish known as sacalait or crappie and a fourth titled "Loss," which chronicles the escalating disappearance of Louisiana's freshwater marshes as a result of shortsighted dam building and oil company canals.

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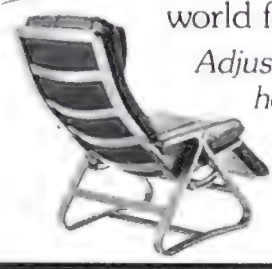

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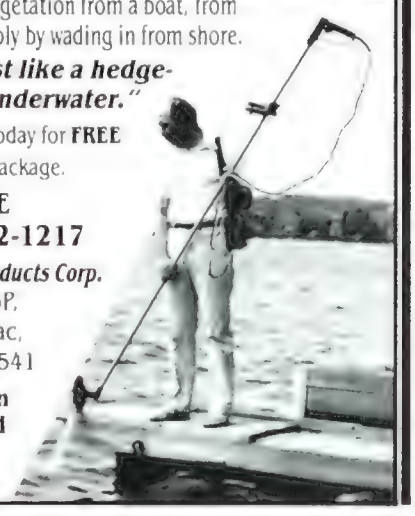

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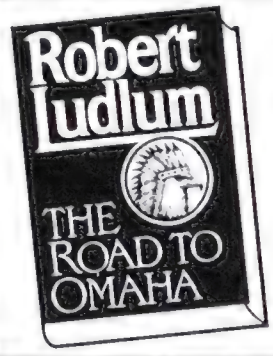

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humored gonzo style laced with the occasional memorable image. One afternoon he is permitted to accompany Hall and another undercover agent as they cruise the Mississippi River with a duck poacher they're out to snare. The poacher allows as how he'd kill a man if the money was right. "Most of us would," he insists. "Tell me that ain't so." Dave Hall affably agrees. All Reisner could think about at that moment, however, was how he would have liked to take the poacher and "hold his head in duck dung until he had been asphyxiated."
Donald Dale Jackson lives and writes in the wilds of Connecticut.

Let It Ride
Samuel F. Pickering jr.
University of Missouri Press, $19.95

"A writer who has his sights trained on the Nobel Prize or other earthly triumphs," wrote E. B. White toward the end of his life, "had best write a novel, a poem, or a play, and leave the essayist to ramble about, content with living a free life and enjoying the satisfactions of a somewhat undisciplined existence."

Rambles literary, familial and natural fill Sam Pickering's days, and in his fifth collection of personal essays he again invites us along the familiar paths of his life. They are paths bordered with the beauty of wildflowers, cleared by the wise observations of children, and made smooth by the common sense of middle age.

Pickering teaches English at the University of Connecticut at Storrs, and his identification with the character of John Keating—played by Robin Williams—in the film *Dead Poets Society* is the occasion for several of these pieces. The fictional teacher stands on desks and exhorts his prep school pupils to suck the marrow out of life. *Dead Poets'* screenwriter had been one of Pickering's students at a Nashville school 20 years before and credited his old teacher when the film became popular.

The "real" John Keating makes little of the connection: "Living life to the fullest—seizing the day and gathering rosebuds, as John Keating put it in *Dead Poets Society*—is all right for children, most of whom know little about flowers, blooms, or blight. Keating's prescription for living, however, would not do for me. I am too old to live anywhere near the fullest; and if I tried to seize but an hour, I would be swept away by a cardiovascular storm, carried

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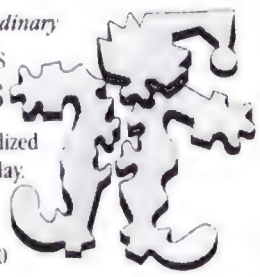
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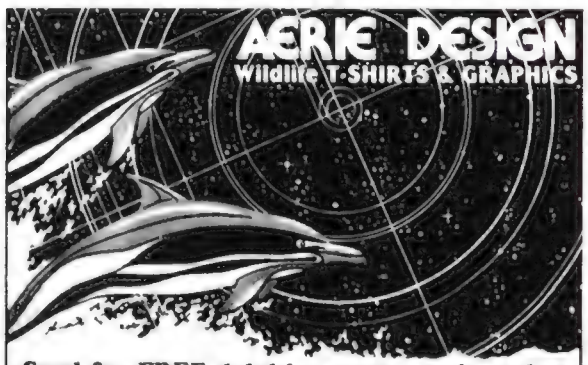

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off to that land where there is no night or day, only eternity, and where all the roses are white lilies."

Readers have come to know Pickering's characters well: his wife, Vicki, children Francis, Edward and charming little Eliza. Whether Pickering is clambering about on Nova Scotia summer nights with a miner's lantern on his head in "Night Thoughts" or taking up arms against automatic teller machines, he is thoroughly engaging in each of these 12 essays.

The local Republican Party, hoping to bask in the reflected glow of Pickering's celebrity, asks him to run for Congress. He demurs, and muses about it during a walk, watching flies: "That morning my thoughts were not deep or original, but they were thoughts, not postures assumed because they were expedient or winning. My attention soon wandered from the flies, following broad whim, not the dictates of party or campaign. Through thorns and the swelling, heavy hips of the roses pushed spikes of long-leaved speedwell, cool and blue."

In the title essay, it is the Saturday before his father died. The clutter of life follows: paperwork, filling the car with gas, preparing for the imminent funeral. Pickering recounts bringing his father to Connecticut from Tennessee; he talks of the Easter leg of lamb and raspberry pie taken to the nursing home; of the stuffed bunny and drawings the children brought for "Baa-Baa." Pickering reads Byron and Tennyson to his father as he lies dying, and occasionally the old man's lips will pick up the words of "Locksley Hall" or "In Memoriam."

There is nothing maudlin or flip about this. Dismantling households and burying parents are common experiences. But Pickering's eye for detail and belief that the simplest things in life are most important set this essay, and all his work, apart. In a revealing moment, he recalls his father, on that Saturday before he died, suggesting they "have a couple of drinks and let it ride."

The phrase sticks in Pickering's head, and we are left with this image after the Tennessee burial and the paying of bills: "I expect he is in some heavenly Hospitality Room, far beyond this vale of grief and costs. And I don't expect he's sitting there mildly playing 'Whispering Hope' on his harp. No, he is telling stories about monkeys, maybe even elephants, quoting Tennyson, and drinking nectar, good, fermented nectar, laced with vermouth and a green olive or two."

Reading Pickering, who in an earlier collection said he once told a job interviewer he believed in "grace, with dignity, charity, and bourbon whiskey," is like taking a walk with your oldest, wittiest friend. He can talk of Anthony Trollope's Doctor Thorne or Toad of Toad Hall or English teachers or shopping at Victoria's Secret with a kind of quiet hilarity and distance that marks him as one of E. B. White's heirs. There are echoes here of "Getting Ready for a Cow" and "The Death of a Pig," classic White essays.

But Pickering has created his own comfortable world, and it is always a pleasure to slip into his company for a time. He ruminates on Connecticut, on the South, on daffodils and traveling with children. "People in my books repeat themselves," Pickering writes at one point. "My family and I, even the characters I create, have a light, familiar consistency." In this transitory life, that is no bad thing.

Jon Meacham, writer and reviewer, reports for the *Chattanooga Times*.

American Steel: Hot Metal Men and the Resurrection of the Rust Belt
Richard Preston
Prentice Hall, $19.95
Avon Books, $10 paper

During the 1980s the nation's economic pundits declared the manufacturing Midwest damaged beyond repair. The area's industries were stagnant, their technology antiquated and their plants rundown. Management wasn't investing in modern equipment, and unions wouldn't change restrictive work rules. More-efficient competitors at home and abroad had transformed America's muscular industrial heartland into the Rust Belt. To many, nothing exemplified these problems more than Big Steel.

Big Steel, the companies that create the basic metal of the Industrial Age out of iron ore, coke and limestone, looked ready to roll over and die. Their furnaces and rolling mills were decrepit, their work force contentious, and their executives more comfortable shuffling financial instruments than running factories. Beyond that, the steelmaking process is dirty, difficult and dangerous. Few cities wanted this sprawling, polluting, no-growth industry in their backyards, and many young engineers

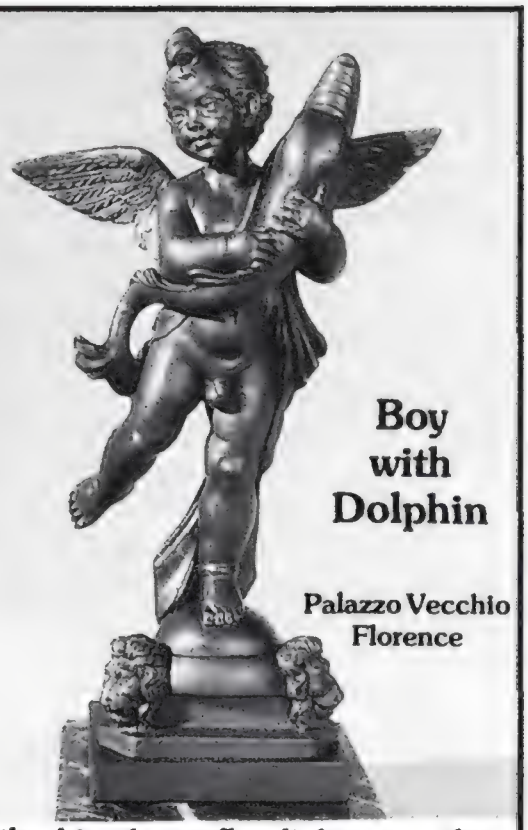
and managers found the business uninspiring. Big Steel's spirit and energy were gone. The future, it seemed, belonged to scientists who designed silicon chips or twisted genes, not to men who melted metal.

The problems of Big Steel weren't only internal. A new set of competitors, the minimills, was nibbling away at the rolled-steel market. The minimills (small only in comparison to the enormous operations of the integrated manufacturers such as Bethlehem and U.S. Steel) make steel more cheaply than their mammoth competition because they start with scrap. Instead of smelting ore into iron and cooking iron into steel, these companies recycle old steel into new. Minimills couldn't produce all the metal the country uses, but they had discovered a profitable niche and were exploiting it eagerly. One of the most energetic of these minimill operators was a company named Nucor.

Nucor Corporation, as described in Richard Preston's marvelous *American Steel*, couldn't be more different from Big Steel, especially in its organizational priorities. In the late 1980s this Fortune 500 company had only three top executives. Corporate headquarters was a "suite of rented offices" about the "size of a group dental practice," and the chairman of the company, Ken Iverson, worked in the "cheapest-looking executive lair" the author had ever seen. But Iverson had a vision of what Nucor could become, and he knew how the company could do it. He wanted to do something that no one had ever done successfully—build a plant to make flat-rolled sheet steel in one continuous process, a machine "for the direct casting of molten steel into a ribbon."

American Steel describes how Nucor turned a field near Crawfordsville, Indiana, into a new kind of steel mill. It talks about building a factory as big as a battleship, about the untried technology of thin-slab casting, and the repeated failures that accompanied the Crawfordsville operation's start-up. Most of all, it tells the story of men and women struggling to bring a new industrial process to life.

This outline may remind readers of Tracy Kidder's *The Soul of a New Machine*, a book about the development of a new, more powerful, computer. But *American Steel* isn't about an industry's soul. It is about bone and gristle, muscle and guts. It is about the heaviest of heavy



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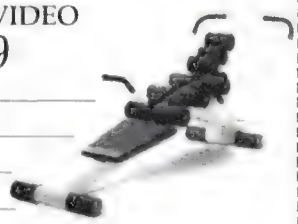

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industry, the meaty heart of the manufacturing complex that makes modern life so convenient. This book is about gargantuan machines and bubbling metal, about taking rust and scrap and making it into something bright and new. It is about steel.

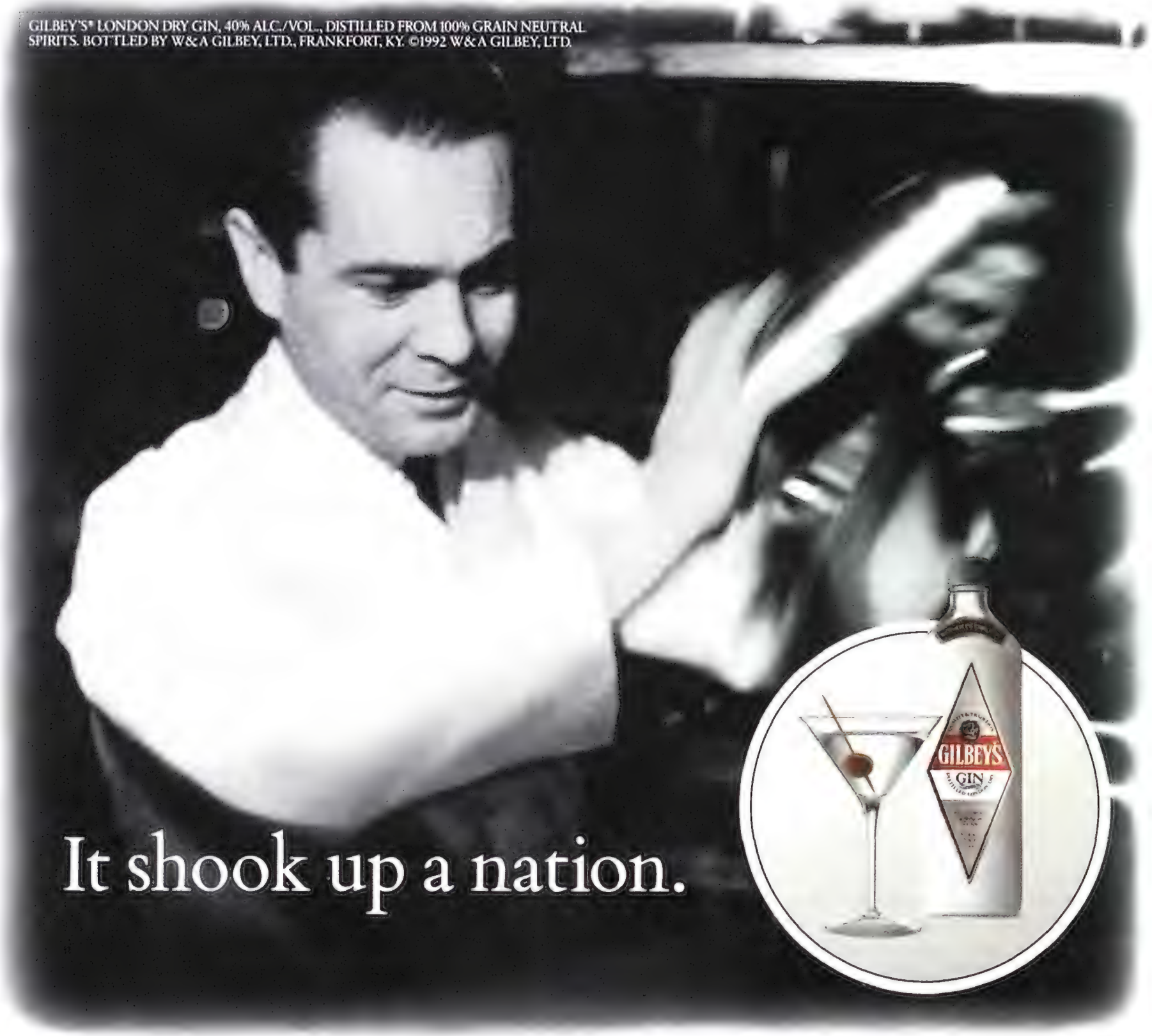
The scale and fury of the steelmaking process are hard to imagine. Fed by power cables a foot in diameter, the electric arc furnace in Nucor's melt shop eats "about one-eighth the power output of a commercial nuclear reactor" when it's running hard. Finishing off a furnace full of molten steel—"lancing a heat," in the trade—is as scary as lancing a whale. The colors—sapphire ropes twisting from an electric arc, the tangerine glow of a hot-cast slab, a slag-covered melt of steel roiling like "a bed of daffodils blowing in the wind"—are garish beyond belief. Ironically, the end result of this fearsome process is a product that, at around 20 cents a pound, is "cheaper than chicken parts."

This is a book of bellowing machines and boiling metal. Workers curse and scream; danger haunts their lives, and in a fall from a high girder or a terrifying splash of molten steel, people working at the Crawfordsville plant die.

Does the success of Ken Iverson's continuous casting machine presage an industrial renaissance in the American heartland? Not really. Big Steel is still shutting down plants, and other manufacturers are still moving elsewhere. If Nucor is resurrecting the Rust Belt, it is doing so by melting it down and casting it out as something new. But *American Steel* is not intended as an economic treatise. It is a book about initiative, risk-taking and old-fashioned hard work.

Preston makes steelmaking sound like something from the ninth ring of hell. Even reading about the noise and heat and light and stink is overwhelming. But his extravagant descriptions also convey the ensorcelling power of liquid steel. He makes you want to flip down your dark glasses and peer into the furnace with the rest of the casting-deck crew, to put on a silver suit and hear the deep whoosh of steel running through the mouth of the casting mold. He takes a gigantic industrial process and exposes its human face. He makes steel come alive.

John R. Alden, a onetime copperworker, is a writer in Ann Arbor, Michigan.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Additional reading

Whale rescuer (p. 30)

Sierra Club Handbook of Whales and Dolphins by Stephen Leatherwood and Randall Reeves, Sierra Club Books, 1983

The World's Whales by Stanley Minasian, Kenneth Balcomb and Larry Foster, Smithsonian Books, 1984

Communication and Behavior of Whales, edited by Roger Payne, Westview Press, 1983

Whales, Dolphins and Porpoises, edited by Richard Harrison and Michael Bryden, Facts on File, 1988

Orienteering (p. 44)

Be Expert With Map & Compass: The Complete "Orienteering" Handbook by Bjorn Kjellstrom, Scribner's, 1976

Orienteering: Skills and Strategies by Ron Lowry and Ken Sidney, Orienteering Ontario (Willowdale, Ontario, Canada), 1989

Murder at the 14th Control by Wilf Holloway, Orienteering Service of Australia (Melbourne, Australia), 1986

Orienteering North America (magazine), SM & L Berman Publishing (Cambridge, Massachusetts)

George Bellows (p. 58)

The Paintings of George Bellows by Michael Quick, Jane Myers, Marianne Doezema and Franklin Kelly (exhibition catalog), Harry N. Abrams, 1992

George Bellows, Painter of America by Charles H. Morgan, Kraus Reprint (Millwood, New York), 1979

Comet hunting (p. 74)

Comets: A Chronological History of Observation, Science, Myth, and Folk-

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Starlight Nights: The Adventures of a Star-Gazer by Leslie C. Peltier, Harper & Row, 1965

The Romance of Comets by Mary Proctor, Harper & Brothers, New York, 1926

Renée Fleming (p. 84)

"Renée Fleming: Cinderella 1989" by B. J. Mears, *Opera Monthly*, May 1989

Demented: A Provocative Look at Opera's Greatest Divas by Ethan Mordden, Simon & Schuster, 1990

The Last Prima Donnas by Lanfranco Rasponi, Limelight Editions (New York), 1985

The Great Singers: From the Dawn of Opera to Our Own Time by Henry Pleasants, Simon & Schuster, 1966

Sports cartoons (p. 96)

Browser's Book of Beginnings by Charles Panati, Houghton Mifflin, 1984

How Did Sports Begin? by R. Brasch, David McKay (New York), 1970

Oxford Companion to World Sports and Games, edited by John Arlott, Oxford University Press, 1975

Cincinnati Museum Center (p. 102)

The Bicentennial Guide to Greater Cincinnati: A Portrait of Two Hundred Years by Geoffrey J. Giglierano and Deborah A. Overmyer, Cincinnati Historical Society, 1988

Cincinnati the Queen City by Daniel Hurley, Cincinnati Historical Society, 1982

The Railroad and the City: A Technological and Urbanistic History of Cincinnati by Carl W. Condit, Ohio State University Press, 1977

The Cincinnati Union Terminal 1933 Pictorial History (reprint edition), Cincinnati Historical Society, 1987

The WPA Guide to Cincinnati (reprint edition), Cincinnati Historical Society, 1987

The Doolittle Raid (p. 112)

I Could Never Be So Lucky Again by Gen. James H. Doolittle with Carroll V. Glines, Bantam Books, 1991

Doolittle's Tokyo Raiders by Carroll V. Glines, Van Nostrand Reinhold, 1964

Thirty Seconds Over Tokyo by Capt. Ted W. Lawson, edited by Robert Considine, Random House, 1943

Four Came Home by Carroll V. Glines, Van Nostrand, 1966

Smithsonian highlights

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Begin your visit at the Smithsonian Information Center, located in the Castle. Hours are 9 A.M. to 5:30 P.M. daily.

Extended summer hours
Starting Monday, June 15, through Labor Day, Monday, September 7, three Smithsonian museums will operate on extended hours daily from 9:30 A.M. to 7:30 P.M.: National Air and Space Museum, National Museum of American History and National Museum of Natural History. Extended hours at the National Zoological Park are from 8 A.M. to 8 P.M. for grounds, through October 15, and from 9 A.M. to 6 P.M. for the animal buildings, through September 15.

Freer remains closed
The Freer Gallery of Art is closed until May 1993.

Festival of American Folklife
The 26th annual Smithsonian Festival of American Folklife will be held on the Mall June 26-29 and July 2-5, from 11 A.M. to 5:30 P.M. This year's festival, cosponsored by the National Park Service, will feature programs on New Mexico, workers at the White House, American Indian musicians, and the Maroons. Events will include craft demonstrations, music and dance performances, storytelling, cooking.

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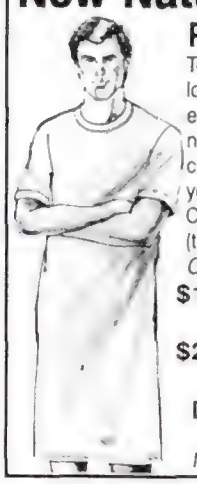

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Special June exhibits and events

National Portrait Gallery
Arnold Newman's Americans (through August 16) Images of major personalities of post-Depression America by the renowned photographer. See *Highlights continued*, pages 140-41.
Poster Portraits (through August 16) Posters from the gallery's collection feature politicians, athletes, stars.

National Museum of American Art
Chicano Art: Resistance and Affirmation, 1965-1985 (through July 26) The first national exhibition to examine the art of Mexican-Americans.
Elizabeth Layton: Drawing on Life (through June 28) Drawings by the octogenarian artist.
Between Home and Heaven: Contemporary American Landscape Photography (through June 28) A new look at the American landscape.

Renwick Gallery
John McQueen: The Language of Containment (through July 26) Exhibition of 43 baskets by one of America's most important craftsmen.

National Air and Space Museum
Star Trek (through September 7) Show looks at the historical, political and cultural issues of the 1960s incorporated in its episodes. Passes required daily; call (202) 786-2122 for details.
Antarctica (6 P.M. daily through June 14; 7:30 P.M. daily, June 15-September 7) New Imax film explores the world's southernmost continent.

National Museum of American History
American Encounters (opens June 24) New permanent exhibition focuses on the three cultures that have converged in New Mexico's Upper Rio Grande Valley—American Indian, Hispanic and Anglo-American.
American Pressed Glass Tablewares, 1875-1900 (through October 31) Exhibit showcases late 19th-century pressed pattern glass from the museum's collection.
First Ladies: Political Role and Public Image New permanent installation examines the various roles of our nation's First Ladies.

National Museum of Natural History
Seeds of Change (through May 23, 1993) Exhibit explores the dramatic changes brought about by the exchange, begun 500 years ago, of five "seeds"—sugar, corn, the potato, the horse and disease—between the Old World and the New.
Peoples of the Luzon Mountains: Philippine Photographs by Eduardo Masferré (through September 7) Images from 1934-56 document peoples of Luzon highlands.

National Museum of African Art
Recent Acquisitions/New Dimensions (through September 27) Etchings, linocuts, watercolors and ceramics by nine modern artists from Nigeria, Côte d'Ivoire, South Africa and Kenya.
Between Man and the Gods: Sacrifice and Ceremony on a Cast Metal Ring (through September 7) Centuries-old cast metal ring from Nigeria.

Arthur M. Sackler Gallery
When Kingship Descended from Heaven: Masterpieces of Mesopotamian Art from the Louvre (through August 9) Loan exhibition presents some of the world's most celebrated works of art.
Arts of Mughal India (through December 6) Paintings and objects from the late 16th century to the 18th trace history of India's Mughal empire.

Hirshhorn Museum & Sculpture Garden
Crosscurrents of Modernism: Four Latin American Pioneers (June 11-September 7) The innovative works of artists Diego Rivera, Joaquín Torres-García, Wifredo Lam, Roberto Matta.
Directions—Thomas Struth: Museum Photographs (through August 16) Works document interplay between viewer and masterworks in European art museums.

Anacostia Museum
To Achieve These Rights: The Struggle for Equality and Self-Determination in the District of Columbia, 1791-1978 (through September 30) Exhibit examines the struggle by black people to secure equal rights in the nation's capital.

Arts and Industries Building Experimental Gallery
Psychology: Understanding Ourselves, Understanding Each Other (through September 9) Developed by the American Psychological Association, hands-on exhibit helps children and adults explore their own psychological processes.

Cooper-Hewitt Museum (New York)
The Cooper-Hewitt Collections: A Design Resource (through August) Some 1,200 objects chronicle the history and collecting philosophy of one of the most important repositories of design.

National Museum of the American Indian (New York)
Weaving a Mayan Heritage: Clothing by Juana Cavanaugh (through July 12) Handmade woven textiles by Juana Cavanaugh, an Ixil Indian from Guatemala.

Exhibition catalogs

Catalogs available currently include:
Arnold Newman's Americans (paper, $35; cloth, $60)
Between Home and Heaven: Contemporary American Landscape Photography (paper, $35; cloth, $50)
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Smithsonian on the air

Speakers Corner with Roger Mudd Weekly public radio series presents lectures by scholars and experts from around the world. Check local listings.
Smithsonian Presents Invention Series of half-hour television programs explores spirit of innovation behind invention. Tuesdays, 9:30 P.M. EST, the Discovery Channel. Check local listings.

Resident Associate Program

To become a Resident Associate, or for fee and ticket information, call (202) 357-3030. June events include:
Vinx! (June 26; 7 P.M.) Percussionist, singer and songwriter Vincent De Jon Parrette—Vinx—in Smithsonian debut.
The Heart of the Sky: Travels Among the Maya (June 15; 7 P.M.) World traveler, author Peter Green Canby discusses his encounters with present-day Maya.

Smithsonian Institution Traveling Exhibition Service

SITES organizes and circulates exhibitions to cities throughout the United States and abroad. To sponsor a show in your community, write SITES, Smithsonian, Washington, D.C. 20560. Here are some June exhibits:
• Jersey City, New Jersey (June 6-July 5) *Seeds of Change* (panel exhibition based on the NMNH exhibit), Liberty State Park.
• San Diego, California (June 13-July 19) *The View From Space: American Astronaut Photography, 1962-1972*, International Aerospace Hall of Fame.

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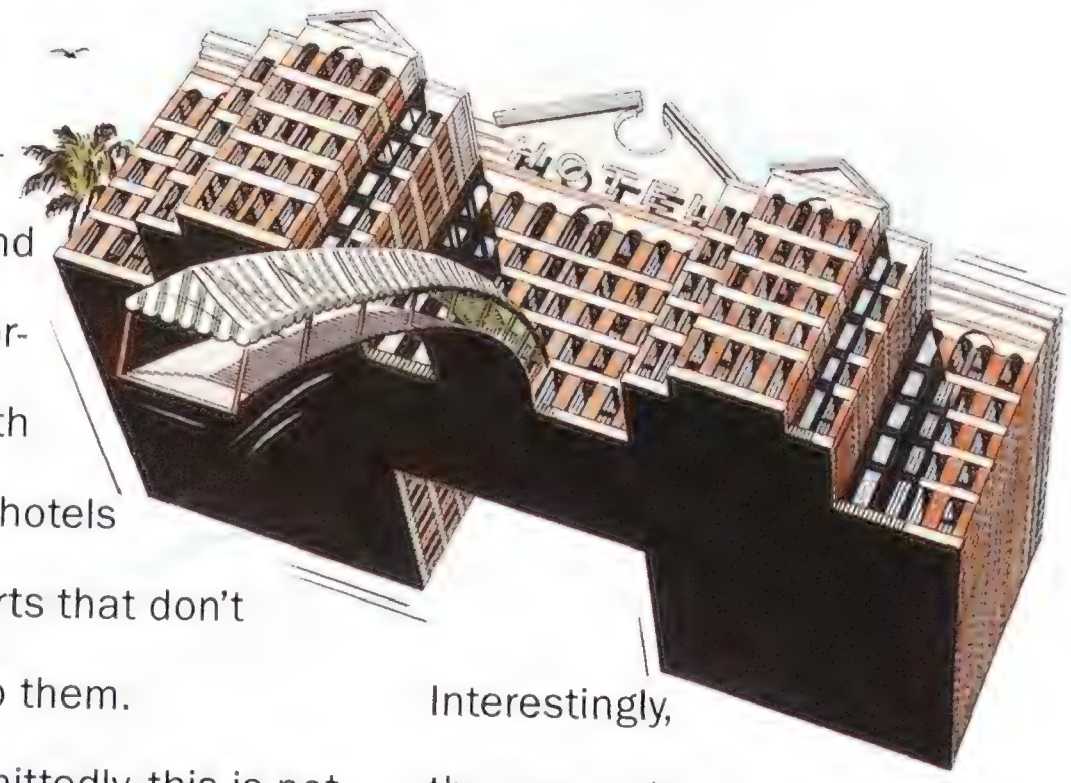

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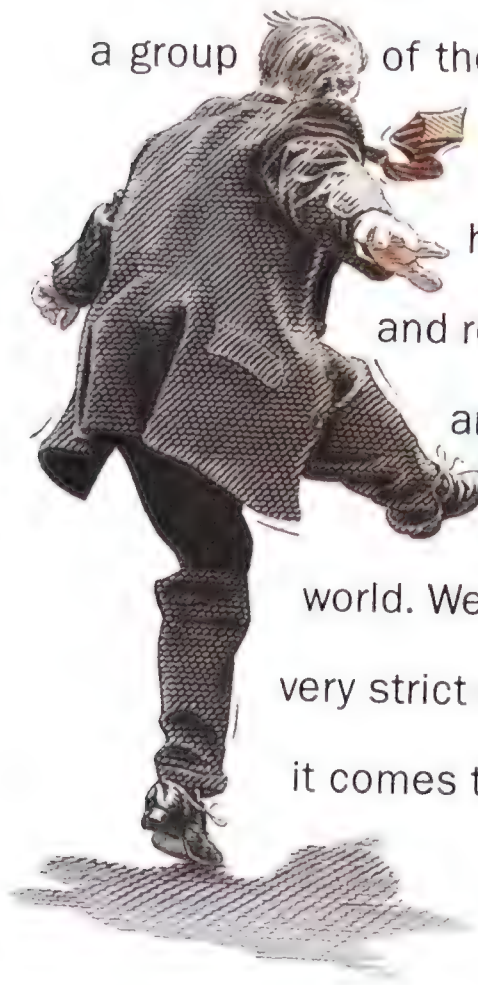

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Highlights continued

Arnold Newman's knowing portraits

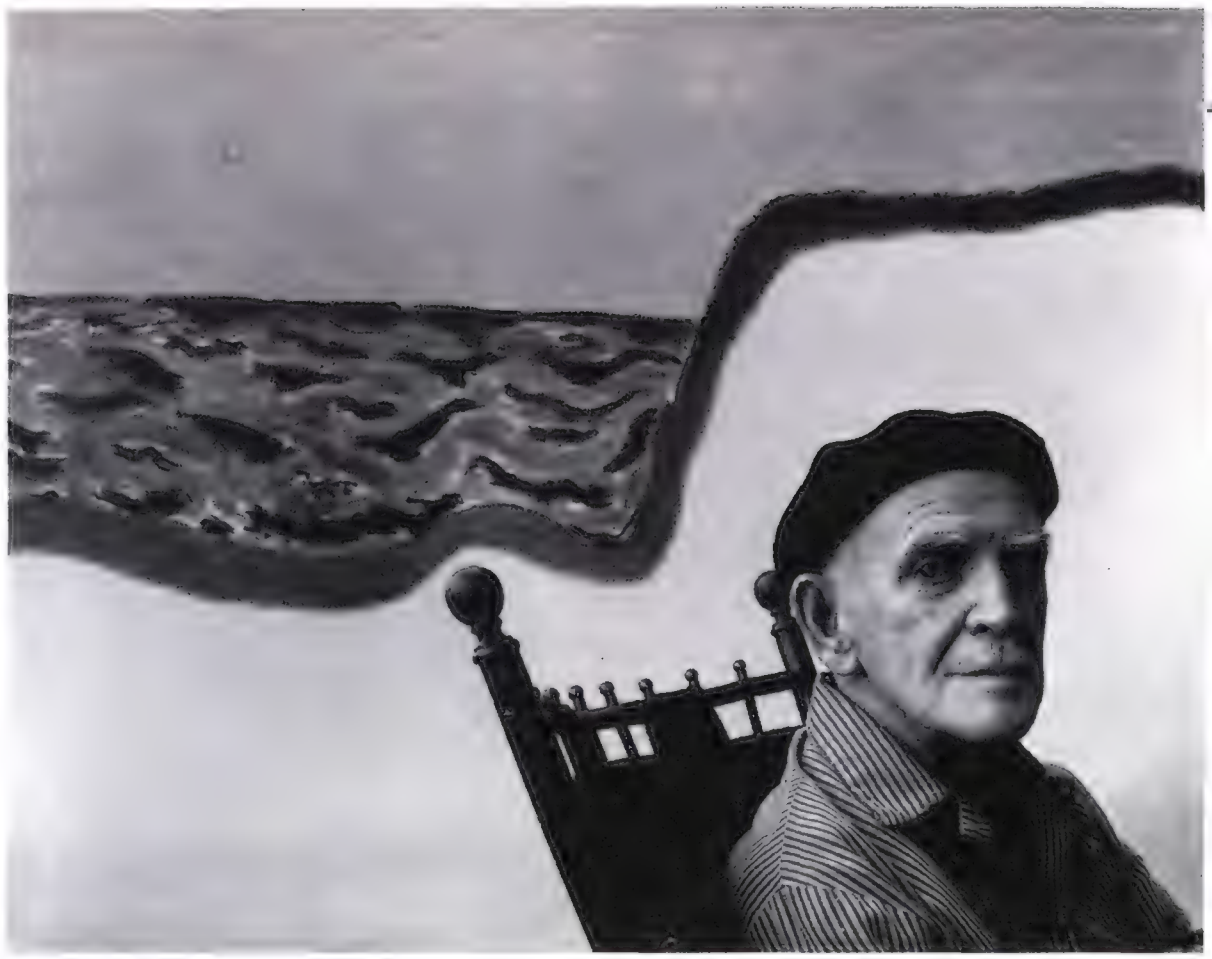
A collection of images of celebrated Americans by the noted photographer is at the National Portrait Gallery

"You don't take pictures with your camera," Arnold Newman insists, "you take them with your heart, your mind, and, sometimes, your gut." Of his portraits, he says, the most important thing is the person. "But people exist in space." It is this belief that set the stage for his innovative "environmental portraits." Placing his subjects amid the furniture, the accouterments, of their particular lives, Newman created a new genre of photography and a body of work distinguished for its individual style, its variety and its cumulative portrait of history's players: politicians, musicians, writers, scientists, entertainers, artists.

In a career spanning half a century, "Arnold Newman has established himself as one of the most productive and distinctive portrait photographers of our day," says Alan Fern, director of the National Portrait Gallery. "Arnold Newman's Americans," on view through August 16, showcases the gallery's collection of the best of these portraits.

A New Yorker by birth, Newman started out as a painter. When the Depression forced him to leave college, he found work in a portrait photography studio, where he quickly honed the tools of his soon-to-be life's work. In the early 1940s, he photographed many of New York City's "family" of artists—Raphael Soyer, Max Ernst, Piet Mondrian, Marcel Duchamp. These portraits were the subject of his first major exhibition—a show that launched his career with such magazines as *Life, Fortune, Look, Holiday* and *Harper's Bazaar.*

For Newman, the strongest images often result from the interaction of sitter and context. From entertainer Gypsy Rose Lee, reclining beneath her art collection, to artist Milton Avery, caught beneath the undulating line of one of his own paintings, Newman's images invite the viewer to see his subjects as he did.
Diane M. Bolz



Milton Avery, artist, 1961

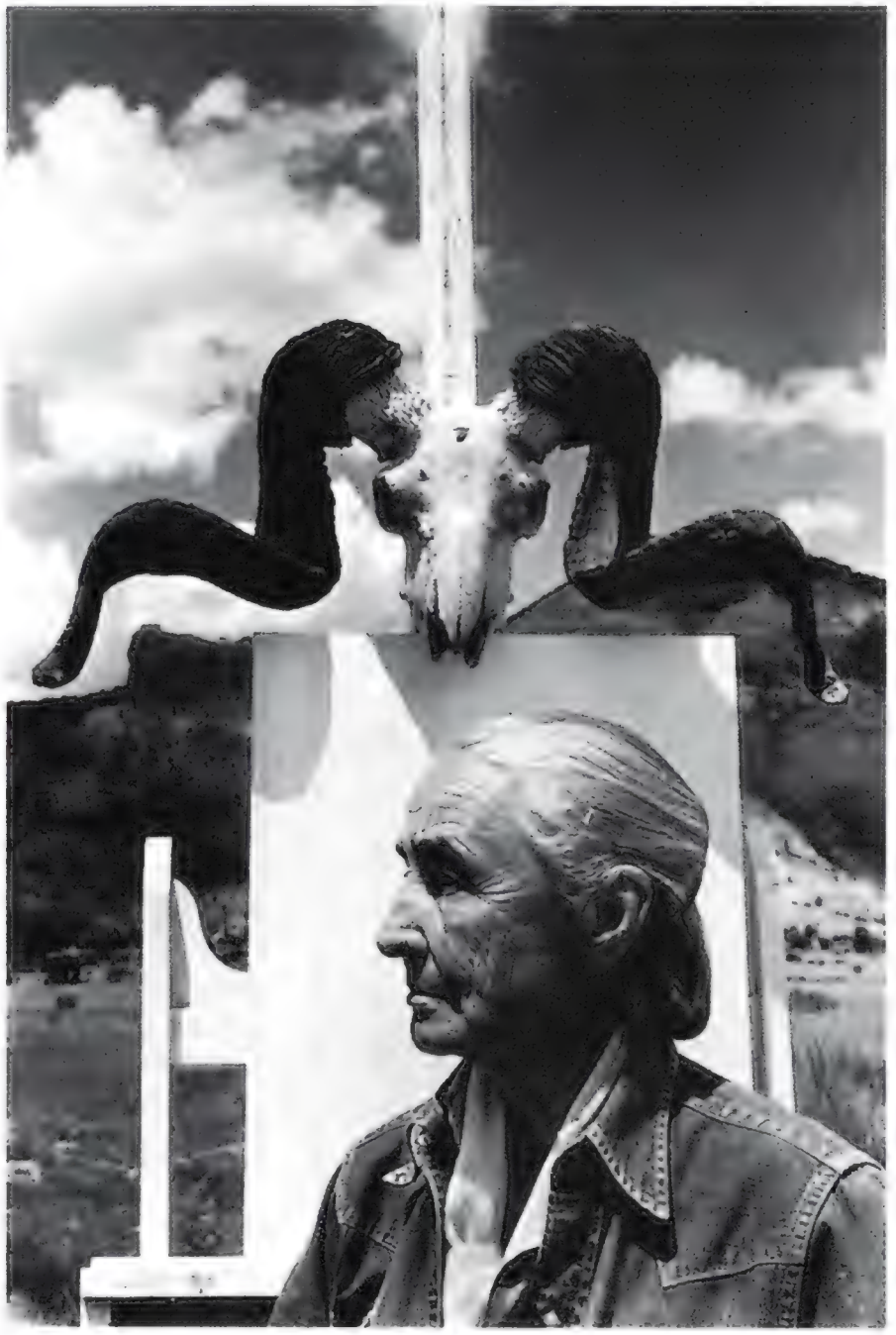
Zero Mostel, actor, 1962

Jacob Lawrence, artist-educator, 1959

Marlene Dietrich, actress, 1948

Gypsy Rose Lee, entertainer, 1945

Georgia O'Keeffe, artist, 1968



Frank Lloyd Wright, architect, 1947

The Smithsonian Traveler

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Domestic Study Tours

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Alaska *July 9-21 or July 30-August 11*

Pueblo Indians *July 11-19* Santa Fe.

Oregon *July 12-19* Natural history.

Colorado for Families *July 18-24*

Black Hills to the Tetons *July 20-30*

NEW **Cowboys and Outlaws** *July 21-30*

Nez Perce Trail Ride *August 8-16*

Waterton-Glacier *August 22-September 2*

Coast of Maine Cruise *August 23-September 2*

Native Cultures of the Southwest *August 26-September 5*

NEW **Great Smoky Mountains** *August 29-September 6* Hiking.

Maine: An Insider's View *September 1-8*

Civil War: Eastern Theater *September 4-14*

Olympic Park-Mount Rainier *September 5-13*

Pacific Northwest-Columbia River Cruise *September 5-18*

NEW **Great Camps of the Adirondacks** *September 12-19*

Arches and Canyonlands *September 19-26*

New York Theater *September 24-27*

Grand Canyon *September 24-27 or October 8-10*

Bryce, Zion and the North Rim *October 1-11*

NEW **California's National Parks** *October 4-12*

Sojourn in Sedona (Arizona) *October 8-14*

NEW **Chesapeake Birds** *October 24-November 1*

Christmas in Williamsburg *December 10-13*

Christmas at the Smithsonian *December 17-20*

Christmas in Santa Fe *December 20-27*

NEW **Rocky Mountain New Year's for Families** *December 26-January 1*

Foreign Study Tours

Countryside Tours *June-October* Relaxing sojourns in France, England, Wales, Czechoslovakia, Italy, Switzerland, Germany, Greece and Mexico.

China *June-October* Several tours.

Abbotsford Air Show (Vancouver) *August 5-9*

Kenya Tented Safari *August 6-23*

Iceland-Greenland Cruise *August 9-21*

NEW **Yorkshire for Families** *August 10-20*

NEW **Nova Scotia** *August 16-27*

Elbe River Cruise (Germany) *August 16-27*

Mongolia and Trans-Siberian Railroad *August 16-September 6*

Switzerland by Train *August 20-September 1*

Edinburgh Festival *August 21-31*

NEW **Estonia, Latvia, Lithuania** *August 25-September 6*

NEW **French Waterways** *August 31-September 11*

Medieval Jewels of the Midi (France) *September 2-14*

NEW **8th Air Force (England)** *September 2-15*

Islands of Indonesia *September 3-24*

Environmental Cruise (Europe) *September 9-22* From Brussels to Barcelona aboard the *Illiria.*

Byzantium Cruise *September 9-26*

NEW **United Germany** *September 10-24*

Southern Italy and Sicily *September 11-25*

Madagascar *September 11-28*

Canadian Rockies *September 12-23* Hiking.

English Canals *September 12-24*

Literary Ireland *September 20-October 2*

Black Sea Cruise *September 20-October 3*

Journey of Odysseus *September 20-October 12*

Paradors of Spain *September 26-October 9*

NEW **Asia Minor** *September 28-October 11*

Himalayan Kingdoms *October 1-20*

Soviet Union Transformed *October 7-17*

NEW **Battlefields of France and Belgium** *October 9-22*

NEW **Atlantic Crossing** *October 18-November 5* Aboard the *Sea Cloud.*

Copper Canyon (Mexico) *October 23-30*

NEW **Japan Arts** *October 25-November 7*

NEW **Borneo and Indonesia Cruise** *October 27-November 13*

London Interlude *October 29-November 7*

NEW **Hidden India** *October 29-November 22* Focus on arts and crafts.

NEW **Columbus in the Caribbean** *November 4-14* Aboard the *Sea Cloud.*

Christmas in Winchester *December 17-28*

Seminars

Operation Desert Storm (Washington, D.C.) *September 10-12*

Oxford *September 12-26*

Istanbul *September 14-27*

Writing from Nature (Wyoming) *September 15-18*

Write to Smithsonian National Associate Program, Washington, DC 20560 or call (202) 357-4700 for tour and seminar brochures.

SMITHSONIAN-STYLE

Florence *September 15-30*

French Riviera *September 18-30*

Creative Writing (Annapolis) *September 20-24*

Aircraft Restoration (Washington, D.C.) *September 21-24*

Fabric and Furniture (Los Angeles) *September 22-27*

The American Avant-Garde (New York) *September 29-October 3*

Atomic Age (Los Alamos) *September 29-October 3*

Yellowstone Ecology (Wyoming) *October 5-11*

Catalina Island Ecology (California) *October 12-16*

Northwest Crafts (Seattle) *October 13-18*

Antietam *October 15-18*

Seminars in Santa Fe *October 18-22*
Archaeology, literature and art, or cooking.

Women of the West (Santa Fe) *October 28-31*

History of Photography (France) *November 1-10*

The Power of Maps (New York) *November 7-11*

Research Expeditions

Contribute your talent and financial support to Smithsonian research. Work with curators at museums or in the field.

Saltville, Virginia *July 12-25 and July 26-August 8* Excavate prehistoric mammals.

Washington, D.C. *July 19-25* Work on videodisk archiving project.

Washington, D.C. *July 19-August 1* Archive documents at the Air and Space Museum.

Edgewater, Maryland *August 2-8 and August 9-15* Research environment and plants.

Crow Agency, Montana *August 12-18* Document the annual Crow Fair.

Front Royal, Virginia *September 12-26* Research wildlife in the Shenandoah Valley.

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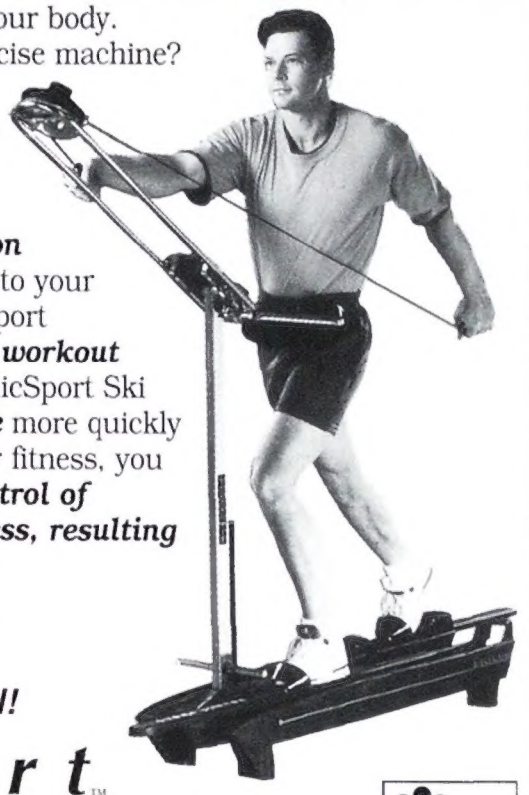

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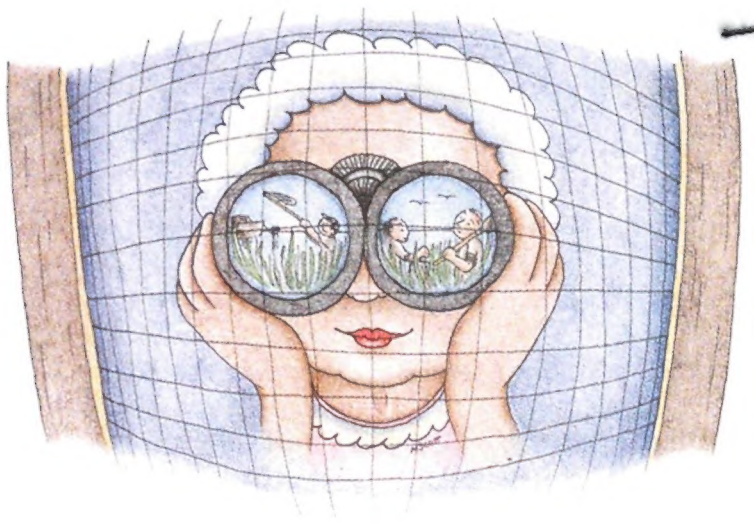
By Bailey White

'Put those damned binoculars down, Lila'



My father craved an adventurous life, and when I was just a little girl he went off with an anthropological team to record the physical characteristics of four fierce groups of people in Southwest Asia. My father had no training as an anthropometrist, and his job on the expedition, as close as we could figure it, was to grab the subjects and hold them still while the scientists applied the spreading calipers and took hair and blood samples "where possible."

The leader of the expedition was a kind gentleman, and he took pity on my mother, who was to be left at home for a year and a half with a farm to run and a house full of unruly children. He gave her, as a parting gift, his telescope. It was a beautiful instrument, all gleaming brass and leather and ebony. Professor Meade laid it in my mother's hands. "My great-grandfather had it at Trafalgar," he told her. "Now I want you to have it." Then he swept away in a swirl of English pipe tobacco, old leather and oiled canvas, my father staggering along behind him, dragging the cases of clattering instruments.

The year and a half went by, and my mother studied every distant object she could find, from celestial bodies in the night sky to the pond a mile away from our house. Through the lenses of Professor Meade's telescope it looked like a bright magical place where frogs leapt silently and deer drinking at the water's edge had no fear of Man.

My father came back, sunburned and irritable. He had presents for us: a lamp for my mother, made out of the bladders of two camels, and exquisite rag dolls for my sister and me, with hands with separated fingers like real hands, and ferocious embroidered faces with furious dark eyes. My mother, on a creative whim, turned the lamp upside down and hung it by an electrical cord over the dining room table. She wouldn't let us play with the dolls. She suspected lice and packed them away in mothballs.

Soon my father left on another adventure, but this time he never came back. The camel bladder chandelier couldn't seem to adjust to our climate. In the summer it would droop and stretch until it almost touched the tabletop. In the winter it would shrink and suck itself into a tight snarl up near the ceiling.

My mother got old and crippled. As her mobility decreased she grew more and more dependent on Professor Meade's telescope. "Bring me my spyglass!" she would call. Someone would fetch it, and she would put her elbows on the windowsill, lean the shaft of the telescope against the frame, and gaze.

Then one day a granddaughter of Professor Meade's came to see us, "on a matter of some importance," she said. Professor Meade was on his deathbed. There was only one thing he wanted—his telescope. My sister and I fretted. "Now what will Mama look at things through?" we asked. But it didn't bother Mama one bit. "His great-grandfather had it at Trafalgar," she said. "Of course he shall have it back." She slid the telescope into its Morocco-leather case, snapped the snaps and gave it to Professor Meade's granddaughter.

And Mama didn't seem to miss it. As a premium in the $30-pledge category she got a pair of tiny plastic binoculars from the local public radio station. Looking through them was the equivalent of taking three steps closer to your subject. "But it's hard for me to take three steps," she pointed out. She once was able to bring the telescope into focus on an osprey catching a fish a mile away; now she could see the purple finches on the bird feeder at the kitchen window a bit clearer, and recognize friends and family when they came to call—a moment before they opened the screen door and said to her, "Put those damned binoculars down, Lila."

One summer we all took a vacation in a big old house on the bay side of a little island off the coast of northern Florida. It was hard for Mama to walk on the soft sand, so she sat on the screen porch all day staring through her binoculars over the marsh. Every morning a boat from the local marine lab would pull up and anchor just offshore. People would wade around in the grass with nets and spades and bottles.

By the end of the first week the screen was bulged out from the pressure of Mama's binoculars. She didn't seem to understand that they did not give her the same dignity of distance she had been able to achieve with the telescope. We tried to reason with her. "They can see you, Mama," we hissed. But she just pressed the binoculars harder against the screen. "What are they doing? What are they doing down there?" she asked.

Then one evening one of the men came up to the house. "Oh no," we thought. "My name is Walter Lewis," the man said to Mama. "Would you like to see what we're doing down there?" And very carefully he helped her over the sand to the marsh.

After that, every morning at dawn she would go down the beach. She would sit in a chair at the marsh's edge and look at the things they brought up.

"It's clams," she told us. Dr. Lewis gave her books, and she sat up all night reading about bivalve mollusks.

At the end of our last week on the island, Dr. Lewis came up to the house again. "Today a group of us from the marine lab is going to do some work on the migration of the spiny lobster," he said to Mama. "We'll be gone about a month. We thought you might like to come along."

The last we saw of her, she was heading for the open ocean. We stood on the dock and waved goodbye. But she didn't see us. She was leaning forward in the bow of the boat with her little plastic binoculars pressed to her eyes, peering out to sea.

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